DEC 16 1881
SMITHSONIAN

THE AMERICAN

GAS LIGHT JOURNAL

RLOMAN&KENNY,N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXXIV.—No. 3.
Whole No. 519.

NEW YORK, WEDNESDAY, FEBRUARY 2, 1881.

$3 PER ANNUM
IN ADVANCE.

A. M. CALLENDER & CO., Proprietors.
G. WARREN DRESSER, C.E., Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European Countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

The Annual Meeting of the Association will be held at Young's Hotel, Boston, on the 16th, 17th and 18th days of February next, commencing at 11 o'clock on Wednesday morning, Feb. 16th.

Members intending to propose to the Association the names of applicants for membership are requested to send them to the Secretary at least one day before the meeting. The Directors will meet, at the same place, on the evening of February 15th, at eight o'clock. Papers to be read should be forwarded to the Secretary in season to be presented by him to the Directors, at that meeting, for their approval.

GEO. B. NEAL,
Secretary.

BOSTON, Jan. 10, 1881.

TENTH CENSUS OF THE UNITED STATES.—STATISTICS OF GAS MANUFACTURE.

DEPARTMENT OF THE INTERIOR, CENSUS OFFICE,
WASHINGTON, D. C., September 27th, 1880.

Under the provisions of the 18th section of the Act of March 3, 1879, GEO. W. DRESSER is appointed SPECIAL AGENT of the CENSUS OFFICE to collect the statistics of GAS MANUFACTURE throughout the United States.

The Special Agent so appointed has all the authority of an Enumerator in the Census. He is fully empowered to exact all the information required by the Census law and the schedules of interrogatories prepared in conformity therewith.

All information communicated to the Special Agent *will be held by him strictly confidential.* He is sworn not to disclose any portion thereof to any person except his superior officers. The facts thus obtained will be used solely in compilation, to ascertain the general facts and conditions of gas manufacture in the towns and cities of the United States, *and will not be put to any use which can possibly prejudice the interests of any individual or corporation.*

FRANCIS A. WALKER,
Superintendent of Census.

We would call the attention of all gas companies to the above appointment. In prosecuting the work of gathering statistics of the various manufactures it was found that the general form of questions was not so well adapted to gas companies as to secure a uniformity of returns, and that the result would be only partial information, which would be of relatively small value in itself, and would only serve to render the general result incomplete. It was therefore determined to make a special branch of enquiry, the same as has been done with the iron and steel, glass, silk, mining, brewing, transportation, petroleum and many other leading industries.

The gas industry of the United States represents already a large amount of capital, and is one of vital importance to the comfort and convenience of its citizens; and what ought to be constantly borne in mind is that the industry is to-day, as we believe, comparatively in its infancy. The future development of the business seems, from all the signs of the times, to admit of indefinite extension. New applications and uses for gas are constantly on the increase. No full and reliable statistics of this industry have ever been made; and the object of the present enquiry is to gather such information as will be of use to gas makers themselves, when compiled and arranged in proper form, without in any manner prejudicing the interests of anyone.

The questions have been carefully prepared to give the facts of manufacture from the coal shed to the consumer's meter. The questions of cost of selling gas, taxes, interest, etc., do not enter into manufacture, and consequently are not to be found in the schedules.

It is our earnest desire to make this enquiry a success and a credit to the gas manufacturers, so that they may take their proper place among the great industries of our land; and we ask the hearty co-operation of the fraternity in carrying out the labor incident to the undertaking.

The schedules will be forwarded as soon as possible, and it is urgently requested that replies may be returned at an early day to give ample time for compilation, which will mainly be by States. Where any information can be given, without prejudice, that is not called for by the questions, ample space will be found for it on the blank leaves of the schedules.

Franked envelopes for the return of the schedules will be sent with them, and everything has been arranged in such a way as to give as little trouble as possible to those making the returns. It will be seen by the terms of the appointment that all returns are strictly confidential; and everyone can rest assured that no one will have access to the returns, and that no other use will be made of them save that stated in the letter of appointment.

AN ACCIDENT IN ELECTRIC LIGHTING.

A short time ago a gas consumer in one of the New York city companies reported his gas supply deficient. A fitter was sent to the premises to correct the trouble, and naturally commenced his examination at the meter to see whether the trouble was in the service or in the house.

He commenced to disconnect the meter from the service by unscrewing the "union" at the inlet of the meter; with one hand on the service and the other on the "union" he severed the connection, and at the instant he did so saw a spark pass, and, receiving a violent shock, found himself on the floor, while the gas, which was ignited by the spark, burned freely from the service. Recovering himself, after a short while, he turned off the gas from the service fully satisfied that the supply, up to that point, was ample. The question was, where that spark came from, and investigation developed the fact that an electric light wire came into the premises, and that, in all probability, a connection had been made in some way with the piping in the building, and that the current was quietly finding its ground connection through the meter to the service pipe and thence to the ground. This is often done with small currents, such as are used in telegraph and telephone instruments, without any apparent danger; but when the question of handling the larger currents used in electric lighting is involved, it becomes a much more serious matter.

While electricians are anxious to find an electric meter, it certainly is not advisable for them to make too much use of the gas meter for their return current, because that instrument, although it is extremely accurate when moves in its proper direction, viz., forward—still it cannot be relied upon for either gas or electric measurement when moving backwards.

As a matter of greater interest to gas companies it would seem that if danger of explosion results from the use of gas pipes for return currents, there is no good reason why those pipes should be so used, at least with the consent of the gas companies. A separate return wire should be used always. At any rate gas-fitters had better take care, when making their connections, to keep one hand behind them when electric wires are in the neighborhood. It was quite fortunate, in the instance cited above that no greater injury resulted to the man or the premises.

STREET LAMPS IN BROOKLYN.

In December last bids for lighting about 14,000 street lamps were made, as follows:

For the Brooklyn Company's district, $20 per lamp, and for the Williamsburgh, Nassau, Peoples, Citizens, and Metropolitan districts, $24 per lamp.

The committee on lamps and gas reported favorably to the Common Council, and an order was passed for the commissioner of public works to award the contracts. The new City Council rescinded the order awarding the contracts, and directed a readvertising for bids.

At their last meeting the Aldermen awarded the contracts at $20 per lamp to the Brooklyn Company, and $23 to the others per lamp per annum, and the authorities are trying to persuade the companies to accept the reduced price.

The following is a copy of the resolution which was passed by the Board of Aldermen at their meeting on January 24, 1881:

"*Resolved*, That the department of city works be and it is hereby directed to cause contracts to be prepared and executed with the several gas light companies of the city of Brooklyn to furnish gas for the street lamps, and for lighting, extinguishing, cleaning and repairing of the same, within their several districts. The resolution was adopted, and unanimous consent was granted."

The prices were $20 per lamp for the Brooklyn, and $23 for each of the other districts.

GAS EXPLOSION.

The front stoop, of St. Joseph's Industrial Home of the Sisters of Mercy, on 81st street, between Fourth and Madison avenues, was blown to fragments, with a loud report, about eight A.M., on the 27th ultimo. Fortunately no one was injured. The explosion resulted from an explosive mixture of gas and air that had accumulated under the stoop; but just how the mixture was ignited is not definitely known. Theories are plenty; but facts are few. The street was made by rock filling, and examination showed that there was a considerable leakage of gas in the neighborhood. Holes dug in the street gave a very strong smell of gas, and efforts are being made to find where the leak is; but in streets of this character it is exceedingly difficult to locate a leak, from the fact that the gas finds its way for a long distance from a leak through the interstices of the filling. There is some controversy as to whose gas is leaking, as there are two sets of mains in the streets.

The Electric Light in Liverpool.

The manner in which the Corporation of Liverpool intend to avail themselves of their power to light by electricity the streets and public places of the city has been at length settled, at least to the extent of the first "considerable experiment" in the most important thoroughfares. Advertisements requesting tenders for the proposed lighting having been inserted in all the leading newspapers, local and otherwise, the Corporation eventually found themselves in possession of two proposals—from Messrs. Siemens Bros. and the British Electric Light Company respectively—to which their choice was necessarily confined. Messrs. Siemens Bros. asked £5800 for lighting the selected district from sunset to sunrise for a period of twelve months, with an extra allowance of £2250 for fixing and removing the apparatus.

The British Electric Light Company offered to do the work, in their own way, for the same period, for £2895 10s. The latter tender was accepted by the City Council at their meeting on Wednesday last, and the contractors are to be ready to light up by the 1st of March. The price to be given for the electric lighting is nearly twice as much as is now paid to the gas company for the present service, which includes several Sugg's and Bray's powerful burners, and a number of four feet per hour ordinary street lamps. The city engineer, in his report on the electric lighting proposals, remarks that if the necessity for increased illumination is to be taken for granted, the sixty 2000-candle electric lamps proposed to be fixed by the British Electric Light Company will, in terms of illuminating power, be considerably cheaper than gas. This is certainly one way of putting it, but it is not exactly the right way. In the first place we all know that talk of thousands of candle power comes very readily from electric lighting contractors, when they know perfectly well that their lamps will never be put into a photometer and tested to a tenth part of a candle, in the same manner as gas is examined daily.

Would the contractors for supplying Liverpool with lamps of 2000-candle power consent to a fine whenever their light fails to yield this power, or even half of it? Again, the proposed 50 lamps are to supplant 245 gas lamps, and we are grieviously mistaken if it is not found that some portion of the roadway lying midway between these new lights will be no better illuminated than it would have been had the same value been given for the more closely-placed gas lamps. This, however, is a matter that must be left to experience to decide, for it may be supposed the Corporation will take steps to assure themselves that they are getting the full value for their money.

A striking peculiarity of the electric light, often remarked in other cases, is brought prominently forward in the engineer's report. The difference between lighting the allotted district from sunset to midnight, and between sunset and sunrise, is only about £160 for the year. In other words, it only costs this amount to keep the generating machinery and carbons going for the few extra hours per night; but, of course, at the same time the full amount of illumination must be kept up, for with electricity there is no medium—it is either in full blaze or nowhere. This fact illustrates the unmanageableness of the arc-light, and at the same time suggests what might be done with gas if the cost of brilliant lighting is to be incurred only during the few hours of darkness in which it is really required, and no more than the ordinary lamps are kept alight for the benefit of the police patrol and the night cab driver. As Mr. Clement Dunscombe, the city engineer, remarks, the illuminating power of the proposed electric lights will, on the contractor's own valuation, be, in a sense, considerably cheaper than that supplied by gas in the same thoroughfares; but it may be suggested that the power of a lighting medium expressed in the gross, and its power of illuminating other objects, are very different things. If the corporation of Liverpool are content to trust the lighting of their streets to a string of light-beacons of the height of three story houses, they will find out what this difference means, and may eventually learn that fifty or even twenty candle power, in close proximity to the object desired to be seen by its aid, is quite as useful as a light of ten times the reputed power a hundred yards off, and carefully hoisted up out of the way.—London *Journal of Gas Lighting*.

EDINBURGH GAS LIGHT COMPANY.—We are pleased to notice that Mr. Robert Mitchell has been appointed to the position of chief superintendent for the Edinburgh Gas Light Company. This gentleman's name is associated for many years past with the gas industry in Scotland. Until a very recent date he was at Coatbridge, and designed and carried out an entirely new works there; after which he was appointed by the gas committee of the Glasgow Corporation to take the management of their station at Maryhill. —*Review of Gas and Water Engineering*.

The Determination of Sulphur in Sulphides and in Coal and Coke.

By Thomas M. Drown, M.D. Lafayette College, Easton, Pa.

The use of bromine as an oxidizing agent, particularly for sulphur, has become very general in analysis, replacing the stronger oxidizing acids. The object of this paper is to describe briefly the experience which we have gained with this reagent in the laboratory of Lafayette College in the oxidation of metallic sulphides.

Most of the simple sulphides, as blende, pyrite, etc., when exposed to the combined action of an alkaline hydrate and bromine, and finally to hydrochloric acid, are completely and promptly dissolved. The procedure is as follows: The very finely pulverized mineral is first treated, in a beaker, with a solution of sodium hydrate of a specific gravity of 1.25, and heated; bromine is then cautiously added to supersaturation, and finally hydrochloric acid to acid reaction. If any of the sulphide is not taken up, the same operation may be repeated. It is necessary, however, that the mineral be very finely pulverized. Instead of using the pure bromine, a saturated solution of bromine in potassium bromide may be used with equally good effect.

The process is advantageously simplified by making a saturated solution of bromine in the concentrated alkali. This is done by pouring bromine into a solution of sodium hydrate, of the above given specific gravity, until no more is taken up, and then adding a little of the sodium hydrate solution until the liquid does not give off free bromine. The procedure with this solution is as follows: The pulverized mineral is moistened with, say, 10 cc. of the solution, and heated, then hydrochloric acid added to just acid reaction. Two more additions of the alkaline soultion, in amounts of 20 cc. each, are added at intervals of about ten minutes, each addition being followed by hydrochloric acid. The total amount of the alkaline solution (containing the bromine) used is therefore 50 cc., and the amount of hydrochloric acid should not exceed that necessary to make the solution acid after each addition of the alkali. The mixture should be kept hot. After the final addition of acid, the contents of the beaker is taken to dryness and heated in an air-bath to 110° to 115°C., to render silica insoluble. The dry mass is then taken up by hydrochloric acid and, after filtration, the sulphuric acid is precipitated by barium chloride. In a sample of copper pyrites Mr. F. E. Bachman obtained, in duplicate analyses, 34.05 and 34.12 per cent. sulphur; in zinc blende 32.97 and 33.09 per cent. In another sample of blende Mr. P. W. Shimer obtained 32.71 per cent.

This method of determining sulphur I find especially valuable in the analysis of coal. By the treatment of coal as above described results are obtained which agree very closely. The coal, as such, is not attacked, and the sulphur obtained, therefore, represents that existing in the coal as pyrite, and also as soluble sulphates. The residue left by this treatment has been again subjected to the same process, and yields no more sulphur. On combustion, however, or by complete oxidation, either by oxidizing acids or by fusion, additional sulphur may be obtained, which must represent that combined organically with the coal.

The following are some of the results obtained by Mr. Shimer from bituminous coals by the bromine method. The amount usually taken for analysis was between one and two grams:

Bituminous coals.	Total sulphur by fusion with alkaline carbonates and nitrates.	Sulphur by bromine process.
I.	0.43	0.035
		0.035
		0.035
II.	2.16	1.80
	2.17	1.81
		1.81
		1.83
		1.84
		1.85
		1.87
III.	1.17	0.710
	1.18	0.713
		0.717
IV.	1.48	1.096
	1.49	1.098
	1.50	1.100
		1.100

In comparing the bromine method with others it was found that the treatment with hydrochloric acid and potassium chlorate gave on coals with but little sulphur in the form of pyrite the same results, but on coals with much pyrites the results were decidedly lower than by the bromine method. But too few experiments were tried on this point to be decisive. The action of nitric acid and potassium chlorate depends upon the nature of the coal. Some coals are converted partly into a brown unmanageable solution, and others are oxidized completely to a clear solution. In the latter case, of course, the total sulphur could be obtained.

As was said above, the sulphur obtained by the bromine method represents both the sulphides and sulphats in the coal. The methods ordinarily given for the separate determination of calcium sulphate are faulty. Sodium carbonate readily attacks pyrite, and dilute hydrochloric acid and even water, when heated for some time in contact with pyrite, with access of air, contain notable quantities of sulphuric acid. It would seem, therefore, necessary to dissolve out the calcium sulphate by means of water with the careful exclusion of air.

The determination of the total sulphur in coal by means of fusion with alkaline carbonates and nitrates, or chlorates, I find unsatisfactory, owing, I think, to the large amount of salts in the solution in which the barium sulphate is precipitated. A much better method is to burn the coal in a platinum boat placed in a glass tube in a current of oxygen. The products of combustion may be absorbed by a solution of bromine in hydrochloric acid, or by a dilute solution of potassium permanganate. The latter, I have satisfied myself, gives equally good results with the bromine. It is absolutely necessary, in this process, as originally pointed out by Muck,* that the combustion tube should be washed out with water after the completion of the combustion, since sulphuric anhydride condenses in considerable quantity in the tube beyond the boat. It is further necessary, of course, to fuse the residual ash with alkaline carbonates to determine the sulphur which has not been volatilized by the combustion.

I have in progress an interesting investigation on the effect of coking on the sulphur in coal, to determine what influence the nature of the sulphur —whether in combination with iron as pyrite or organically combined with the coal—has on its elimination in coking. These results must, however, be reserved for a future communication.

Engineers' Club of Philadelphia.

The regular meeting of the Engineers' Club of Philadelphia was called to order on Saturday evening, January 15, by President Strickland Kneas—twenty-six members and three visitors present. Mr. Charles A. Ashburner, Chairman of Committee on Information, presented a paper upon the progress and methods of the Pennsylvania State geological survey. Forty-eight counties have been entirely completed, and eighteen counties partially surveyed, and seven counties remain to be surveyed. The Board of Commissioners estimate that it will require three years to complete the survey of the entire State. He also read notes on mine topography, in which a new method was proposed for determining the area of the available coal in the anthracite region, and cited an instance in which the hypothesis of the method had been sustained by after developments. He also exhibited a complete set of specimens of the crude and refined petroleums from Baku, Galicia, and other European fields, recently received through Hon. Lewis Emery. He also presented a paper by Colonel James Worrall, member of the Club, upon the routes and methods which have been proposed for crossing the Isthmus. The Panama, Nicaragua, and Tehuantepec canal routes, and the ship railroad of Captain Eads were treated, forming a paper too comprehensive to be fairly treated in a short abstract.

Mr. T. M. Cleemann read a paper on the strength of wrought iron columns, showing that the accepted formula of Rankine & Gordon gives imperfect results, and urging the necessity of further experiments on various shapes in order to complete it and render it more exact.

Professor L. M. Haupt read a paper on intercommunications in cities, showing the great value of increased facilities of travel, and applied them specially to Philadelphia. The number of persons using the horse cars during the last year was about one hundred million, and the value of a saving of one mile in distance, and its equivalent in time and power, was computed upon this basis, with some surprising results. The paper was limited to a consideration of the street system only, the railroad system being reserved for the future. The paper contained some valuable suggestions as to important proposed improvements.

The Standing Committees of the Board of Directors for 1881 were appointed as follows:

On Finance—Messrs. Frederic Graff and J. J. de Kinder.
On Membership—Messrs. J. J. de Kinder and George Burnham, Jr.
On Publication—Messrs. Rudolph Hering and George Burnham, Jr.
On Library—Messrs. T. M. Cleemann and Frederic Graff.

Howard Murphy,
Cor. Secretary.

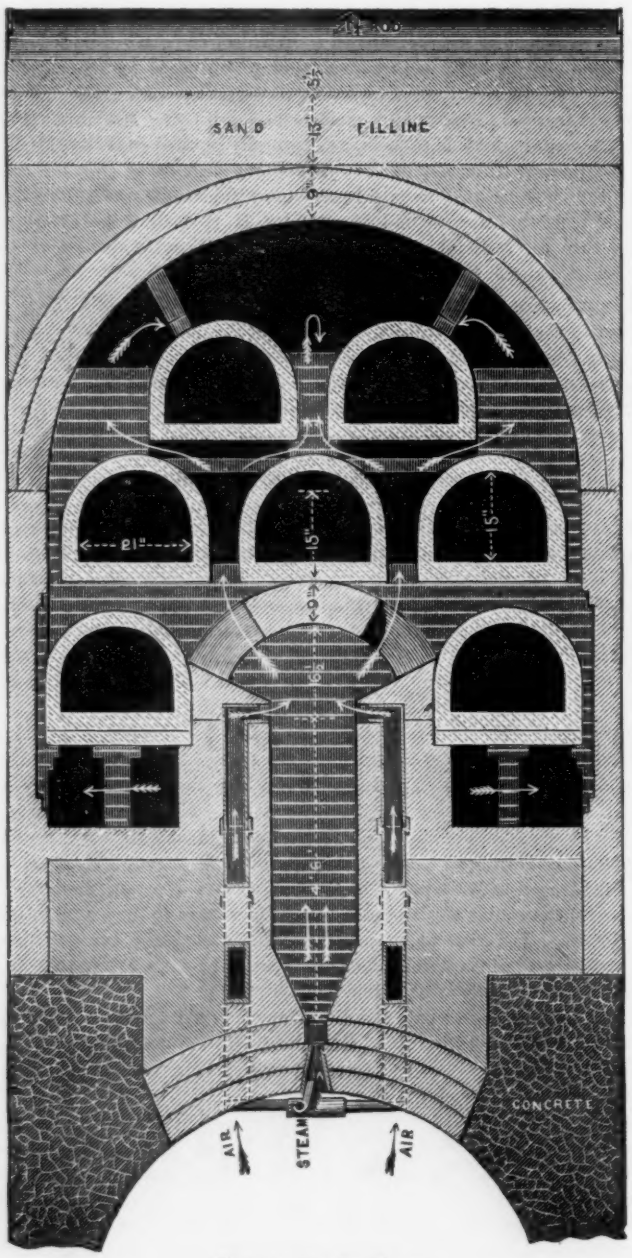
* Fresenius, Zeitschrift, xiv., 16.

[From the London "Journal of Gas Lighting."]

The South Metropolitan Gas Works.

GAS-RETORT FURNACES.

We are compelled to break the series of descriptive notices of the new works at the Old Kent Road station of the South Metropolitan Company, in consequence of the treble lift gasholder, the illustrations of which should naturally follow those of the concrete tank actually constructed for it, being still unfinished. It is our intention only to describe works as completed, and we shall therefore have to wait until the holder has been erected before giving its description in detail. Instead of proceeding with the holder, we now return to the other extremity of the process of gas manufacture, and in the plate accompanying the present number of the *Journal* will be found complete drawings of the carbonic oxide gas furnaces in the latest form as

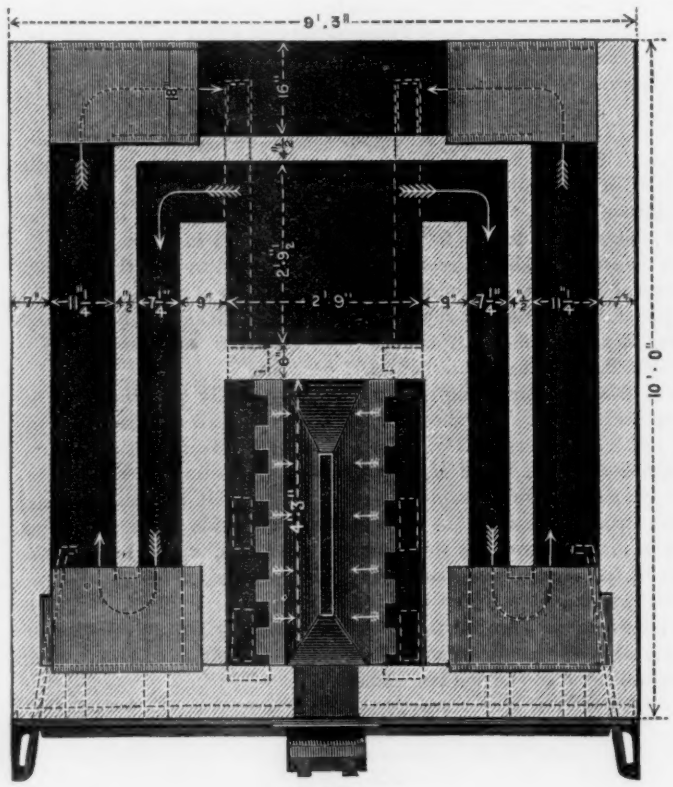


Transverse Section.

adopted at these works. The illustrations and the following description of the construction and working of the new furnaces—which the kindness of Mr. G. Livesey, in giving us the fullest possible information, enables us to publish—may be taken as representing the fruit of the experience of Mr. G. Livesey, Mr. F. Livesey, Mr. Somerville, and the very intelligent foreman, acquired in experiments lasting nearly two years, during which period many different forms of gas furnaces were successively tried and abandoned. It must, however, be borne in mind that even these furnaces as so far from being considered perfect by the above-named gentlemen that arrangements are just now in progress from which better results are expected, for reasons which will be explained later.

For a proper understanding of the principles underlying the experiments instituted by Mr. Livesey, with a view to the discovery of a method of using gaseous fuel for heating retorts which should be free from most of the objections previously applicable to carbonic oxide generators, we must refer to the paper read by Mr. F. Livesey at the last meeting of the British Association of Gas Managers, and to the articles on the subject which have appeared in our columns during the past two years. The information therein given must be collated with the present notice.

The early experiments in this direction at the Old Kent Road were for a year or more made with square-built generators standing separate from the retort stack and underneath the charging floor, in a stage retort house. The best of these furnaces were not satisfactory; there was a great draught, which caused a most intense heat at the fire-bars, to prevent which water and steam were tried with small effect. The air also made its way up the sides of the generator, between the walls and the fuel, cutting the brickwork and burning the carbonic oxide gas in the generator, instead of in the retort setting, where it should have been used. This latter was a very serious defect, and caused an attendant loss of heat, the radiation from the sides of the brickwork generator being so great that the temperature of the under story of the house, or "coke hole," as it would generally be called, was as great as in front of the retorts. It was found impossible to prevent the undesirable infiltration of air through the walls of the separate generator, and in view of the fact that the loss of heat by radiation and contact of air with the exterior of the generator was so excessive, it occurred to Mr. Livesey, after many devices had been tried, including several copied from



Half Plan.

Continental and American examples, that the proper place for the generator was *inside* the setting, just as the old direct-acting furnaces were situated. This involved a certain sacrifice of space in the arch, for the room required for the inclosed generator would have accommodated another retort; but the possible gain in fuel and in the convenience of the workmen warranted a trial of the idea. By this time it is needless to say that Mr. Livesey had satisfied himself of the advantages of gaseous firing on general principles, if only the observed difficulties could be surmounted. The attempt was made at first without much success. The second supply of air intended for the combustion of the carbonic oxide was intended to be heated on the strict "regenerative" principle—by means of channels in the brickwork beside the exit flues. This was a failure; the flues being on the top of the benches, the air had to be drawn *downward* to the furnaces, and this being contrary to the natural law, which would cause the heated air to ascend, an excessive draught was necessary in order to bring it down; and moreover, the brick air channels employed leaked so badly as to be useless, Then it was remembered that some 14 or 15 years ago, Mr. F. C. Hills had patented an arrangement for heating the air supply for ordinary furnaces by causing it to pass through a rectangular cast iron pipe 9 inches by 4½ inches interior measurement, laid beneath the bottom retorts throughout the setting, one pipe serving each furnace. This plan had been tried at the South Metro-

politan works ; but the air passing through the pipes became so heated that when delivered at the grate it melted everything. A modification of this plan has been found to give good results in the system of generator firing now finally adopted, and is one of the most important features of the present design.

It should be stated that these furnaces are not *regenerative* in the full meaning of the word ; that is to say, the air used in complete combustion is not entirely heated by the waste products of combustion escaping to the chimney after having done their work in the setting. What is really done will now be explained. It will be seen by the drawings that the usual arches are utilized ; the furnace being carried down quite to the *extrados* of the lower arch, which is built just here of fire-brick in three rings. The crown of this arch is pierced by a slot 2 ft. 6 in. long and 3 in. wide, which is lined with a cast iron curb bracketed in the middle of its length. This

Half Longitudinal Section.

slot admits air to the generator for the primary formation first of carbonic acid, and afterward, by reduction, of carbonic oxide gas, which is effected by the passage of the air upward through the fuel. The generator is always kept filled with fuel to a height of from 3 ft. to 3 ft. 6 in. A ½-inch steam pipe will be observed ranged alongside the under side of the slot. In this pipe are 12 small holes distributed along the length of the opening in the arch, from which steam, at a pressure of about 35 lbs. per square inch, is directed into the opening. This is to prevent the formation of clinker, and also to keep down the temperature of the lower part of the generator, when the combustion is naturally most intense, to limits which prevent the destruction of the fire-bricks that would otherwise ensue. Both these objects, upon which the practicability of generator firing depends, are completely secured in this way, with an expenditure of steam which costs no more than the annual value of the boiler and apparatus required, the boiler being heated by the waste heat of the main flue of the retort stack.

Carbonic oxide gas being thus produced in the generator, its further combustion is effected by a second supply of air, which is admitted in the first place by two openings in the crown of the lower arch, one on each side of the slot. These openings communicate with the two rectangular cast iron pipes, which follow through the setting the course shown in the longitudinal section, and finally deliver the air, in a highly heated state, by the small orifices opening in the sides of the furnace, in a line 4 ft. 6 in. above the top of the slot. The hot air thus meets the carbonic oxide immediately after it rises from the body of fuel, and a most intense combustion ensues, the whole of the setting being filled with flame.

The settings in which the furnaces are being applied are of seven through D brick retorts, 22 by 15 in. and 20 ft. long. Each retort carbonizes 1 ton 4 cwt. of coal per diem in 6 cwt. charges of 6 hours each, the drawing and charging being by West's machinery. An ordinary furnace for a similar setting, though with smaller retorts, consumes 18 cwt. of coke in 24 hours, or about 20 per cent. of the production, calculating a yield of 4 tons 10 cwt. of coke from 7 tons of coal. The best results obtained with the generator have been a consumption of 12 cwt. of coke per day, or 12 per cent. by weight of the 5 tons of coke yielded from 8 tons of coal carbonized in 24 hours. This result is not always secured, but on an average the saving in fuel by the generator may be taken as fully 25 per cent. of the old consumption. Besides this there is to be reckoned the economy in wear and tear of retorts, furnaces, etc.; the lessened labor (the distressing task of clinkering being abolished) ; and the great regularity in carbonization attainable by the new method. The heating of the retorts is under perfect control, and the rapidity at which carbonization can be performed, and consequently the amount of gas made per mouthpiece, is limited chiefly by the danger of stoppages in the ascension pipes, which occur when the heat is excessive.

The fronts of the settings are covered with plates of iron, used to give security to the retort mouthpieces, and there can be no doubt that these plates cause the loss of a considerable amount of heat; on the other hand they lessen the infiltration of cold air. It is essential that no air, other than that which enters by the proper channels, should find its way into the generator, and therefore the door for the admission of fresh fuel is carefully fitted with a faced joint, and is made to open by falling down, while its own weight keeps it tight when closed. The ease and silence with which the 32 furnaces in the retort stack fitted with them are worked is remarkable, the usual half-naked fireman, toiling with redundant noise over his clinkering and stoking, is nowhere to be seen ; instead thereof a laborer may be observed occasionally letting down a small door, displaying to the view a glowing, though not white-hot furnace, filled with a pale yellow flame, which for the moment appears to have its origin at the open door, and to be caused by the combustion of the entering air. Underneath the charging stage, in the lower regions, nothing can be seen overhead but a range of whitened arches, along the centres of which are gleaming slots, each receiving a number of little jets of steam from an adjoining pipe, while light ashes and dust continually drop from the open slots. A man with a light rod sometimes pricks the refuse when it seems to hang across the slot, but even this is seldom necessary. Such as it is, however, it is the remains and representative of the process of clinkering.

To return to the process of the formation of carbonic oxide, and its final combustion with hot air. It will be seen that a very careful arrangement of draught is necessary in order to insure the admission of the proper quantity of air, both to the slot and to the heating pipe of the secondary combustion. The size of the slot was arrived at after careful observation and numerous experiments with furnaces of different forms and sizes, and by the determination, by means of a small anemometer, of the velocity of air entering the furnace corresponding with the area of the openings into the main flue as controlled by the dampers. It was found that dampers or regulators for the entrance of air to the slot and to the hot pipe did not answer. They gave much trouble, requiring to be altered with nearly every change of wind, or according to the alterations in the draught of the main flue or chimney. It was therefore decided to abandon the use of regulators, and to construct the air passages in accordance with data obtained from the other end. The damper on the main flue was adjusted to an area of 36 square inches, equal to a draught of 2-10ths of an inch of water, or a velocity of about 10 feet per second. This gave a velocity of about 2.33 feet per second, or a draught of about half a tenth through the slot, which has an an area of 50 square inches, and about the same draught and velocity for the cold air entering the square pipes. These pipes are 9 inches by 3 inches, the two together being calculated to have 54 square inches area, so as to allow for an excess of about 10 or 12 per cent. of air over the quantity required for the complete combustion of the carbonic oxide to carbonic acid. As the air is expanded by heat, the carbonic oxide gas is enabled to

combine with its equivalent of air in the combustion chamber, without requiring the help of a sharp or cutting draught. The practical results of this arrangement are satisfactory, and in this case theory and practice are both carried out successfully. The quantity of air required is thus determined. Coke containing 93 per cent. of carbon requires 152 cubic feet of air to every pound for its perfect combustion; as one of these furnaces consumes 6 cwt. of coke in 12 hours, it requires through the slot the oxygen contained in 100,000 cubic feet of air in that time, or about 2¼ cubic feet per second, which, as we have already seen, is near the velocity for which it was designed.

The steam, as already mentioned, is intended mainly to keep the slot clear of clinker, and to protect the fire-bricks of the lower part of the generator. It also fulfills another and important part in the work of the generator. In reducing the temperature of the lower part of the furnace, it suffers decomposition into its elements, and while the liberated oxygen goes to help the formation of carbonic oxide, the hydrogen burns in the setting with useful effect. The steam thus robs the generator of heat only where it is harmful, to give it up again where it is capable of useful service. The whole of the 32 furnaces are supplied with steam from one boiler situated on the top of the bench, and heated, as before described, with the waste heat of the flues.

It has been already remarked that these furnaces are not strictly regenerative; the past description of their method of working will render this clear. At the same time it cannot be made out that all the heat imparted to the secondary air in its passage through the cast iron pipes is diverted from useful work elsewhere. The lower parts of the pipes especially appear only to intercept heat that would otherwise be lost. It is indeed a question whether the situation of the generator is not of such economical advantage that it may compensate for the loss caused by the introduction of cold air into channels bedded in the interior of the setting. The working results are so good that, whatever this loss may be, it cannot be serious.

It is not intended, however, that these settings shall form the last effort in this direction at the South Metropolitan Gas Works. In a new retort house now being built the generators will, like these, be contained in the arches; but the secondary air supply will be heated to the fullest possible extent in a truly regenerative manner by the waste heat of the main flue, which will, for this purpose, be constructed beneath the settings, instead of, as now, above them. As a further testimony to the almost unlimited power of gas-firing, the retorts in this house will be set 12 or 14 in an arch. At present the generators have such an excess of power that they are moderated by being supplied with from 10 to 20 per cent. of breeze or pan ashes mixed with the coke. Even this fails to clinker, but from the closeness with which it becomes packed in the furnace it burns slowly and lessens the evolution of combustible gas. Even in this point—the power of disposing of coke, ashes, etc.,—the introduction of generator furnaces would be a great convenience in many works; but, on the whole, they must be admitted to offer such advantages that in a few years the old-fashioned direct-acting furnace must become obsolete.

Report of the United States Inspector of Gas and Meters.

OFFICE UNITED STATES INSPECTOR OF GAS AND METERS,
403 TENTH ST., WASHINGTON, D. C., Sept. 15, 1880.

SIR:—I have the honor herewith to submit the annual report of this office, showing its operations for the fiscal year ending June 30, 1880. At its commencement will be found condensed tables giving the illuminating power and purity of the gas furnished by the gas companies during the year. Full monthly statements will be found in tables A and B. In the remaining tables, lettered C, D, E, and F, the monthly inspection of meters, the pressure of the gas, and the receipts and expenditures are fully stated.

Very respectfully, your obedient servant,

S. CALVERT FORD,
Inspector of Gas and Meters.

Hon. C. SCHURZ,
Secretary of the Interior.

ILLUMINATING POWER AND PURITY.

The illuminating power and purity of the gas supplied by the Washington Gas Light Company from July 1, 1879, to June 30, 1880:—

Average illuminating power during the year, 16.88 candles.
Highest illuminating power during the year, 19.46 candles.
Lowest illuminating power during the year, 12.39 candles.

Average quantity of ammonia in 100 cubic feet during the year,					1.43	grs.
Highest	"	"	100	"	5.01	"
Lowest	"	"	100	"	.20	"
Average quantity of sulphur in 100 cubic feet during the year,					10.76	grs.
Highest	"	"	100	"	26.03	"
Lowest	"	"	100	"	4.11	"

On various occasions during last fall the light obtained from the gas was dull and poor-looking, particularly in low sections of the city.

According to the instruments used for determining the illuminating power and pressure of the gas in this office, the cause of these depressions was not owing in very many instances to a poor quality of gas, but was to a considerable extent produced by deficient pressure and the presence of naphthaline in the service pipes. The latter is a great nuisance, and baffles the skill and ingenuity of the most competent gas engineers to prevent its formation.

Naphthaline is a hydrocarbon which condenses from the gas in its passage through the mains; crystallizing, it chokes up the services, and in some localities prevents entirely the flow of gas. The cause for deficient light and low pressure in a number of instances can be attributed to the existence of this compound in the gas.

On seventeen occasions during the year the gas supplied by this company was of less illuminating power than sixteen candles, as follows: July 15, 15.53 candles; July 16, 12.39 candles; September 4, 15.82 candles; Septemder 6, 15.75 candles; September 12, 15.01 candles; September 17, 15.85 candles; October 10, 15.30 candles; October 11, 15.88 candles; October 15, 15.57 candles; November 10, 15.86 candles; November 11, 15.95 candles; November 13, 15.86 candles; November 17, 15.78 candles; November 18, 15.76 candles; November 26, 15.59 candles; December 5, 15.81 crndles; January 7, 15.97 candles.

It will be observed that on one occasion the gas was below fifteen candles. The depression was caused by the admission of air in the crown of a gasometer whilst being repaired.

On six occasions the gas of this company contained a slight excess of sulphur over the 20 grains allowed in each 100 cubic feet: September 30, 21.09 grains; October 1, 20.27 grains; October 7, 20.16 grains; October 8, 26.03 grains; October 9, 20.82 grains; January 19, 21.09 grains.

The illuminating power and purity of the gas supplied by the Georgetown Gas Light Company from July 1, 1879, to June 30, 1880:—

Average illuminating power during the year, 16.84 candles.

Highest	"	"	"	19.29	"	
Lowest	"	"	"	13.89	"	
Average quantity of ammonia during the year in 100 cubic feet,					1.96	grs.
Highest	"	"	"	100	"	12.85 "
Lowest	"	"	"	100	"	.27 "
Average quantity of sulphur during the year in 100 cubic feet,					10.78	"
Highest	"	"	"	100	"	17.67 "
Lowest	"	"	"	100	"	1.37 "

On twenty-five occasions during the year the gas supplied by this company was of less illuminating power than sixteen candles, as follows: July 9, 15.94 candles; July 14, 15.58 candles; August 22, 15.06 candles; September 1, 15.12 candles; September 8, 15.80 candles; September 11, 15.94 candles; October 6, 15.27 candles; October 9, 15.42 candles; October 31, 15.79 candles; November 6, 15.96 candles; November 8, 15.55 candles; November 10, 15.61 candles; November 11, 15.78 candles; November 13, 15.36 candles; December 24, 13.89 candles; December 27, 15.81 candles; January 31, 15.95 candles; February 5, 14.69 candles; March 27, 15.95 candles; March 30, 14.56 candles; May 19, 15.50 candles; May 27, 15.52 candles; June 11, 15.82 candles; June 12, 15.72 candles; June 14, 15.75 candles.

On three evenings, namely, December 24, February 5, and March 30, the power was less than 15 candles.

From June 27 to August 9, inclusive, the gas supplied by this company contained a larger per cent. of ammonia than allowed, the excess being from two to seven grains each day over the lawful quantity, five grains in each one hundred cubic feet. This excess of ammonia could not have been prevented by ordinary care and prudence, but was occasioned by some unavoidable cause.

GAS BURNERS.

The burner required by law to be used in determining the illuminating power of the gas in this District is generally known as the Sugg-Letheby, or Old Parliamentary, Argand burner, having fifteen holes and a seven-inch chimney, consuming five cubic feet per hour, and the luminosity derived from this stated consumption must equal in intensity the light emitted by sixteen sperm candles, each burning at the rate of one hundred and twenty grains per hour.

During the months of January, February, and March last, a series of tests were made with burners ordinarily used in general illumination. The object in view, in making the experiments, was to ascertain whether the burners used by consumers furnished the same luminosity for equal

consumption of gas as the standard Argand, described above. Tests were made also with London Argands, manufactured by William Sugg, of Westminster, and the Silber burner, made by Silber Light Company, London.

Description of burner.	Number of tests.	Pressure at point of ignition.	Actual consumption of gas per hour.	Illuminating power, in candles, at rate of actual consumption.	Illuminating power, in candles, at rate of 5 cubic feet per hour.	Value of one foot of gas, in candles.
		Inch.	Cu. feet.	Candles	Candles	
Brass burner, fishtail, 3 ft.....	1*	.60	2.31	4.79	10.35	2.07
Brass burner, fishtail, 4-ft.....	2*	.60	2.95	7.99	13.54	2.70
Brass burner, fishtail, 5-ft.....	3*	.60	4.05	13.17	16.25	3.25
Lava-tip burner, batwing, 2-ft	4†	.60	2.85	8.08	14.17	2.83
Lava-tip burner, batwing, 3-ft	5†	.60	3.30	11.64	17.63	3.52
Lava-tip burner, batwing, 4-ft	6†	.60	3.51	12.45	17.70	3.54
Lava-tip burner, batwing, 5-ft	7†	.60	3.93	14.59	18.55	3.71
Sugg-Letheby Argand, fifteen holes, 7-in. chimney.	8‡	.05	5	17.17	17·17	3.43
Sugg's "G" Argand, thirty-three holes, 8 in. chimney	9§	.255	5	20.77	20.77	4.15
Ellis lava-tip batwing, 5-ft.....	10‖	.50	5	20.32	20.32	4.06
Sugg-Letheby Argand, fifteen holes, 7-in- chimney.	11‡	.05	5	17.63	17.63	3.52
Lava-tip burner, fishtail, 6-ft..	12‖	.60	5	18.87	18.87	3.77
Sugg's "G" Argand, thirty-three holes, 8-in. chimney	13§	.255	5	21.54	21.54	4.30
Empire lava-tip batwing, 5-ft.	14‖	.40	4.13	16.52	20.00	4.00
Sugg's "F" Argand, thirty holes, 7-in. chimney.....	15§	.225	5	20.42	20.42	4.08
Sugg-Letheby Argand, fifteen holes, 7-in. chimney.	16‡	.05	5	17.70	17.70	3.54
Silber's Argand, twenty-four holes, 9-in. chimney.....	17§	.05	5	20.51	20.51	4.10
Sugg's "E" Argand, twenty-seven holes, 7-in. chimney	18§	.225	5	21.02	21.02	4.20
Sugg Letheby Argand, fifteen holes, 7-in. chimney.	19‡	.05	5	17.56	17.56	3.51

* Poor and extravagant.
† Best where small flame is required.
‡ Standard Argand.
§ Excellent where a soft and steady light is needed. Very economical.
‖ Good and economical for general use.

The foregoing tests very clearly demonstrate the great loss of light, and consequent waste in consumption of gas, where burners with small openings are used, particularly where the tips are of metal and of the fishtail form. Burners of this description, consuming from two to four cubic feet per hour, are very generally in use, with and without globes, and it is not at all surprising that complaints should be made of poor light where such conditions exist. Twenty to forty per cent. of luminosity is not an uncommon loss, and in cases where globes or shades are used an additional loss of 25 to 40 per cent. in light is the result.

On the other hand, lava-tip burners with large openings, either batwing or fishtail form, gave an illuminating power of 7 to 15 per cent. greater than the power obtained with the standard (Sugg-Letheby), and nearly equaled the light furnished by the improved London Argands. Flat-flame burners of this description are in every respect suitable and economical for all the purposes of general illumination.

The great improvement in the construction of Argand burners is well proven by the result of tests with Sugg's London Argands and the Silber burners, they yielding twenty per cent. more light than the present standard, and for reading, drawing, or writing, in fact for any purpose where a soft and steady light is needed, similar to that obtained with Moderator oil-lamp, these burners will be found most excellent, and all that could be desired.

INSPECTION OF METERS.

One thousand three hundred and nine meters were inspected and proved by this office during the fiscal year ending June 30, 1880, for the Washington and Georgetown Gas Light Companies and for consumers of gas. Of this number 36 registered fast against the consumers; average error, 5.41 per cent. Eighty-nine registered slow against the companies; average error, 9.87 per cent. One thousand one hundred and sixty-seven registered within the limits required by law, namely, 2 per cent. either way, and were sealed and returned to the companies for service; 17 did not register the gas flowing through them.

Of the above-mentioned meters, 183 were tested on complaint, as follows: 54 were complained of by consumers of gas—23 registered fast, average error, 4.59 per cent.; five registered slow, average error, 5.74 per cent., and 26 registered within the limits allowed by law. One hundred and twenty-nine were complained of by the gas companies—6 registered fast, average error, 7.10 per cent.; 77 registered slow, average error, 16.77 per cent.; 29 registered within the limits allowed, and 17 did not registered. This is caused by the diaphragms or partitions, which are made of leather, having

TABLE C.—*Report of Meters Inspected and Proved for the Washington Gas Light Company and for Consumers of Gas in Washington from June 30, 1879, to June 30, 1880.*

Month.	Whole number of meters tested.	New meters for company.	Number fast.	Per cent fast.	Number slow.	Per cent. slow.	Number correct.	Repaired meters for company.	Number fast.	Per cent. fast.	Number slow.	Per cent. slow.	Nummer correct.	Consumers' meters on complaint of consumers.	Number fast.	Per cent. fast.	Number correct.	Consumers' meters on complaint of comp'y	Number fast.	Per cent. fast.	Number slow.	Per cent. slow.	Number correct.	Consumers' meters on complaint of comp'y that did not register.
July.....	81	.....	.....	.....	.....	.....	.....	72	.....	.....	1	2.66	71	.....	.....	.....	.....	9	.....	.....	9	24.09	.....	.....
August.....	36	.....	.....	.....	.....	.....	.....	27	.....	.....	.....	.....	27	.....	.....	.....	.....	9	.....	12.33	8	15.12	.....	.....
September...	96	.....	.....	.....	.....	.....	.....	91	.....	.....	1	4.33	91	3	.....	.....	3	2	1	.....	2	10.83	.....	.....
October.....	225	121	3	3.33	.....	.....	118	91	.....	.....	.....	.....	90	4	1	7.33	3	7	.....	.....	7	14.99	.....	2
November....	83	32	1	2.83	.....	.....	31	46	.....	.....	.....	.....	46	1	.....	.....	1	3	.....	.....	3	29.61	.....	1
December....	147	93	.....	.....	.....	.....	93	34	.....	.....	1	3.23	33	3	1	7.25	2	11	.....	.....	9	17.99	2	6
January.....	125	81	.....	.....	1	4.33	80	33	...	.....	.....	.....	33	2	2	5.03	.....	5	.....	.....	3	18.55	2	4
February....	49	6	.....	.....	.....	.....	6	27	.....	.....	.....	.....	27	7	4	4.91	3	8	.....	.....	5	21.92	3	1
March.....	148	45	.....	.....	.....	.....	45	93	.....	.....	1	6.67	92	2	2	4.20	.....	7	.....	.....	7	12.63	.....	1
April.....	91	.....	.....	.....	.....	.....	.....	81	1	4.66	1	4.33	79	5	3	3.52	2	3	1	5.66	2	4.75	.....	2
May.....	70	1	.....	.....	.....	.....	1	59	.....	.....	1	3.50	58	5	1	3.83	4	5	.....	.....	5	16.20	.....	.....
June..... ...	66	.....	.....	.....	...	.....	.....	63	.....	.....	.....	.....	63	.....	.....	.....	.....	3	.....	.....	3	8.49	.....	.....
Total....	1217	379	4	*3.08	1	*4.33	374	717	1	*4.66	6	*4.12	710	32	14	*5.15	18	72	2	*8.99	63	16.26	7	17

* Average. REMARKS.—During the fiscal year ending June 30, 1880, this office inspected and proved for the Washington Gas Light Company and for consumers of gas in Washington 1,217 meters. Of this number 21 registered fast, average error, 5.47 per cent.; 70 registered slow, average error, 8.23 per cent. 1,109 registered within the limits allowed by law, namely, 2 per cent. either way; and 17 did not register the gas flowing through them.

S. CALVERT FORD, *United States Inspector of Gas Meters for the District of Columbia.*

perforations in them, which allow gas to flow through the meters without working the gearing which is connected with the index; consequently no registration takes place.

A large proportion of the gas meters now in use in this District are very accurate measurers, and the good results of inspection are demonstrated daily, as the average error of meters that have been once inspected and proved, and complained of again either by the companies or consumers supposing them to be wrong, proves on reinspection to be much less than those meters which have never been inspected and proved by this office previously to being placed in service.

As there are meters still in use in this District that have not been inspected, proved, and sealed, and as probably not more than one in three are correct, I would respectfully recommend that the law be modified so as to require the Washington and Georgetown Gas Light Companies to replace meters of this description within a specified time by meters that have been inspected, proved, and sealed.

I would further recommend that the law be modified so as to require, when for any purpose whatever the heads of meters that have been inspected, proved, and sealed are removed by the gas companies, meters of this description should be classed as repaired meters, and brought to this office for reinspection before again being placed in service.

The seal of the inspector is the evidence that the meter has been properly tested and proven, as required by law. To admit the right of the companies to remove the head of a sealed meter and rectify whatever is wrong and return the meter to service without reinspection and sealing would be to render the law practically inoperative

S. Calvert Ford,
Inspector of Gas and Meters.

Table D.—*Report of Meters Inspected and Proved for the Georgetown Gas Light Company and for Consumers of Gas in Georgetown from June 30, 1879, to June 30, 1880.*

Month of the year.	Whole number of meters tested.	Repaired meters for company.	Number fast.	Per cent. fast.	Number correct.	Consumers' meters on complaint of consumers.	Number fast.	Per cent. fast.	Number slow.	Per cent. slow.	Number correct.	Consumers' meters on complaint of comp'y.	Number fast.	Per cent. fast.	Number slow.	Per cent. slow.	Number correct.
July	27	24			24	2	1	2.50			1	1					1
August	2											2			1	18.66	1
September	23					1					1	22	2	4.33	8	14	12
October	10	1			1							9	1	4.16	4	4.47	4
November	4					2	2	2.87				2			1	32	1
December	4					3	1	3.75	1	4.33	1	1					1
January	12	5	2	6.83	3	7	4	4.12	1	3.66	2						
February	3					2					2	1					1
March																	
April	5					3	1	7	2	7.66		2	1	7.16			1
May	1					1					1						
June	1					1			1	7.33							
Total	92	30	2	6.83	*28	22	9	4.04	5	*5.74	8	40	4	*5.21	14	*17.28	22

*Average. Remarks.—During the fiscal year ending June 30, 1880, this office inspected and proved for the Georgetown Gas Light Company and for consumers of gas in Georgetown 92 meters. Of this number 15 registered fast, average error 5.36 per cent.; 19 registered slow, average error, 11.51 per cent.; and 58 registered within the limits allowed by law, namely, 2 per cent. either way.

S. Calvert Ford, *United States Inspector of Gas and Meters for the District of Columbia.*

Extortions of the Gas Companies.

A METER THAT REGISTERED TEN PER CENT. TOO FAST.

To the Editor of the Tribune:—

Sir—I observe in the *Daily Tribune* of the 9th inst. an article headed "In Trouble Over Gas Bills." My own experience refutes the statements of the Metropolitan Gas Light Company, and goes to corroborate the opinion of "the old and respectable merchant living on Murray Hill," referred to, who asserted that the gas companies were engaged in a system of petty swindling among their wealthy customers. I have the Metropolitan Gas Light Company's gas. Although I know absolutely that we have burned much less gas during the months since August than during the corresponding months of the previous year, I found my bills very much larger after allowing for the advance in price from $1.50 to $2.25 per thousand feet. The increase for September was so startling that I made some inquiry, and found that in every case my neighbors' bills showed the same state of things. I then wrote to the company and sated the facts, and asked for reduction of bill and new meter. The company gave me a new meter, and stated in a letter which I now have that they had tested the former meter, and found "it registered ten per cent. too fast," and credited me 10 per cent. on my bills since August. It would be very interesting to know how many other meters of this company and other companies "register 10 per cent. too fast," or more.

I may mention that the gas bills of the Metropolitan Gas Light Company have never heretofore been left at my house later than the 6th of the month, and usually are left about the 4th. The bill that contained the most remarkable increase ever known in my bills (and that, as I said, for a month in which I had used very much less gas than in previous months) was left on the 16th inst. This fact strengthened my suspicions that I was not being fairly treated.

In your article your reporter states that an officer of the Metropolitan Gas Light Company stated to him that it was impossible for the Company to tamper with the registration of the meters. But how comes it that the Company's meters register too fast? Are these meters not constructed to work for the Company's interest? It wears that appearance. Query: Was there ever a meter that registered too little? A Consumer,

West 52d Street, N. Y. City.

—*New York Tribune.*

[The query of the correspondent is answered in the tables on this and the preceding page.—Ed. Am. Gas Lt. Jour.]

Sensible Gas Makers.

One of the Cleveland gas companies has reduced the price of its product twice during the past seven months, the second reduction—to $1.65 per thousand feet—having been made because the first proved so satisfactory in increasing consumption.—*Detroit Free Press.*

[From the London "Journal of Gas Lighting."]

Midland Association of Gas Managers.

At the close of the conversation which followed Mr. Hunt's remarks on the subject of the comparative diffusive powers of square and circular lanterns, as reported in last week's *Journal*, the reading and discussion of papers was proceeded with.

Mr. G. E. Stevenson (Peterborough) read the first paper, as follows :

THE MANUFACTURE OF SULPHATE OF AMMONIA.

The residual products resulting from the manufacture of coal gas have during the last ten years received a much greater share of attention on the part of gas companies and of corporations having the gas supply in their hands than was formerly the case. One of the reasons for this is the increased value of the tar and the ammoniacal liquor—the tar on account of the development of the demand for tar products consequent on the discovery of the aniline dyes, and the liquor for the salts of ammonia into which it is now universally manufactured. At first those companies who had made long contracts for the sale of these residuals were well content to find, on the expiration of the contracts, that the value of the tar and of the liquor had increased enormously, tenders being made in some cases at a price more than double that of the former contract. In regard to tar, there are at present few gas makers who care to take upon themselves the risks and responsibilities attendant upon the distillation and the preparation of benzol and anthracene ; while the further manipulation of these substances into the dyes of commerce is, I believe, in the hands of a comparatively small number of manufacturing chemists, who keep the practical part of the process as much as possible a secret from the world at large.

After a rapid rise, there has during the past two or years been a diminution in the value of tar products, the supply appearing to have somewhat exceeded the demand, and the manufacture of these products has not of late yielded much profit. I am not aware that any gas company, with the exception of The Gaslight and Coke Company, has been found sufficiently venturous, during the last few years, to commence the working up of the tar themselves, the general impression being that an equally good profit may be made by the sale of the raw tar as by attempting to distil it on a small scale. The case is different in regard to the ammoniacal liquor. The working up of the liquor, *in situ*, instead of selling it to private manufacturers, appears to advance hand and hand with improvements in scrubbing appliances, both springing from the desire to realize the utmost value from the source of profit which the ammonia existing in coal gas presents.

Whether the demand for ammoniacal salts will continue firm, in the face of a great increase in the production, is a question which cannot easily be decided. Although the price of sulphate of ammonia is partly regulated by that of nitrate of soda, the former appears to be gaining in favor as possessing its nitrogen in a better form for the treatment of the soil, and it seems probable that for this reason, and also because of the more extended use of artificial manures of all kinds, we shall not for many years see the production exceed the requirements of the market in regard to this article of commerce. However this may be, at the present time the ammoniacal liquor is a valuable residual of gas manufacture, and it has become a matter of considerable importance that its value should be realized by the undertakings themselves, and that the profit derivable from it should not be allowed to pass into the bands of an intermediate class of manufacturers, especially as the production of sulphate of ammonia is no complicated process requiring special scientific knowledge or skill on the part of the manufacturer, nor necessarily attended by any risk or danger.

Although a price can sometimes be obtained for the liquor which will realize as much profit as if the liquor were worked up into salt, in most cases this is not so. The ammoniacal liquor, being bulky, its carriage is costly, whereas the manufactured salt, bearing a high value in comparison with its weight, can be delivered within any reasonable distance at a moderate expense. The position of the works in regard to the purchase of the acid required in the manufacture is a matter of importance, as this chiefly decides the question whether the manufacture of sulphate of ammonia may be profitably carried on or not. The apparatus to be used is a point worth careful study, and it is this that I desire chiefly to consider in my paper today.

It seems to have been at one time a prevailing opinion that any rough-and-ready method of procedure would do for this department of manufacturing chemistry. The great desideratum, it was supposed, was to have an apparatus as simple and as cheap as possible. Being a bye-product in a gas works, upon which, at first, comparatively little depended, anything would do so long as the liquor was somehow or other worked up, and the salt got rid of. An old boiler was purchased and fixed along with a saturator of the roughest description. The liquor was put into the boiler, a certain quantity of lime added, and the whole boiled up till the ammonia had distilled over, when the fire was drawn, the boiler emptied, and the process commenced afresh. The saturator was a box with a movable lid, and after the acid had been put in, the lid was adjusted, the fume-pipe connected to some chimney-flue, and when the charge was neutralized the lid was removed and the salt got out. Fresh acid was from time to time added to the mother liquor as required, and it would often happen that the charge was saturated before the ammonia was worked off, in which case it was necessary to remove the lid, and introduce an additional supply of acid while the brewing was proceeding, at the imminent danger of suffocation from the ammonia and other vapors arising from the open saturator. The evils of this method of procedure could, of course, only be tolerated when the manufacture was in a very small way indeed. Various improvements were introduced, modifying these defects. A diaphragm was introduced into the saturator, cutting off that portion of it receiving the ammonia, and what is called the pocket saturator was formed. Other saturators had their lids fastened down, and a sliding shutter in the top or side to insert the acid and withdraw the salt. A second boiler has been in some cases introduced, and the liquor distilled by means of a steam pipe instead of by direct firing. In this form numerous appliances are existent at the present time, doing efficient work.

This system of manufacture, however, entails two evils which cannot be got rid of, except by an entire change of procedure. Firstly, the process is intermittent. The charge of liquor in the boiler must be worked off, run out, and a fresh supply put in before the distillation can be continued. Even if the boiler were fed with a constant supply of liquor, the stream of ammoniacal gas must be stopped while the saturator is emptied and charged afresh. All this implies loss of time, and the consequence is the apparatus must be designed of larger capacity for a given production of salt than would be necessary if the process were continuous.

This second evil is of more serious consequence. The ammoniacal salt being deposited in the saturator, the latter must of necessity be opened for the purpose of getting out the salt. In this lies a source of danger which has produced in gas works alone, during the past two years, two disasters fatal to the workmen employed. The danger arising from the possibility of opening the saturator during the distillation may be reduced to a minimum in the case of extensive plant where constant supervision is exercised. At Beckton, for instance, where the saturators are placed under a large shed open at both ends and well ventilated, the pocket saturators there used may perhaps blow with impunity, but in small works where men cannot always be watched, and where the space is confined, such an arrangement is often a fruitful cause of accident.

In order to obviate the necessity of interrupting the production of ammonia from the gas liquor, the method has been resorted to of passing the ammoniacal liquor through a column filled with coke, or other material calculated to divide up the liquor into fine streams, and subjecting it to the influence of steam introduced at the bottom of the column, by which means the ammonia is distilled out of the liquor as it passes through the column. The Coffey still also presents a ready and suitable contrivance for this purpose ; the liquor flows backwards and forwards over a series of trays from the top to the bottom, and the steam passes upwards over the surface of the liquor. I am unable to state when either of these appliances was first made use of for distilling ammonia. The coke column is, I believe, favored by many private manufacturers. It occupies a considerable space, and cannot, on account of its height, be conveniently placed under cover ; otherwise it gives, I believe, satisfactory results.

The Coffey still is used of various forms and dimensions, and there appears to be a considerable difference in its efficiency according to the design. Some stills never take out all the ammonia from the liquor, and are consequently to be classed as defective examples of this appliance. The liquor must traverse a sufficient length of tray surface, must flow over the trays in a sufficiently thin stream, and must occupy a certain length of time in travelling from the top to the bottom of the still, otherwise the distillation will be imperfectly performed. If these considerations be fulfilled, I know of no better system of distilling ammoniacal liquor. To obviate the possibility of danger arising from opening the saturator, it is only necessary to have recourse to the evaporative process. If the acid be used in a concentrated condition, the salt will be deposited in the saturator, and must be removed in a solid form ; but if the acid be diluted, the salt will remain in solution after the charge is neutralized, and will require evaporating to a sufficient degree of concentration before the salt will crystallize. If this plan be adopted, the saturator may be altogether closed, the acid being run off by an outlet pipe at the bottom. When steps were taken three years ago to erect a sulphate of ammonia factory at the Peterborough Gas Works, I decided upon adopting this plan, as presenting the maximum of safety and certainty in working, and as my experience of the working of the apparatus has been eminently satisfactory, I have thought that a description of it might be not without interest to some members of this Association.

The factory proper is 26 feet square and 20 feet high to the springing of the rafters. The roof is constructed with a central square ventilator having

louvres on all four sides. This and openings in the walls above head afford ample ventilation, which is further secured by air gratings round the floor line. Alongside the factory is a sulphate store, and the building also comprises a chemical laboratory conveniently situated for experiments connected with sulphate manufacture. The liquor is pumped from the tanks in the yard, by a Tangye's "special" steam pump, into a wrought iron tank fixed on brackets against the wall of the building, at a sufficient height to admit of running the liquor into the still by gravitation. The still is rectangular in form, and measures 4 ft. 6 in. by 3 ft., by 9 feet long, and is constructed of half-inch cast iron plates firmly bolted together with half-inch bolts. The trays are made of wrought iron, No. 12 B. W. G. in thickness, and they are turned up at the edges ½-inch. They are separated by wood packing pieces bolted to the sides of the still. The spaces between the trays are only 3½ inches in depth—much less than is usual in the Coffey still, and herein lies greatly the secret of successful working. If the spaces were greater the steam would pass away without coming into intimate contact with the liquor. Additional height of still will not compensate for this, because the steam would lose its pressure in occupying the enlarged spaces, and the rush will be wanting which attacks and agitates the surface of the liquor. Although the still is only nine feet high, the length of tray surface over which the liquor has to travel is 100 feet, and the liquor occupies ten minutes in passing from the top to the bottom of the still.

The steam enters at the bottom of the still, and along with the steam also the ammonia from the lime boiler, to which reference will be presently made. The ammonia and steam pass out by a 3-inch pipe from the top of the still to the saturators, of which there are two. These are rectangular boxes, 5 ft. long by 3 feet wide and 2 ft. 9 in. deep. The lids of the saturators are bolted down by six long tie-bolts passing through wood cross-bars at top and bottom. They are lined with lead from 6 to 12 lbs. weight per square foot. The acid, diluted in the proportion of 2 parts water to 1 part of acid, is supplied from a tank at a convenient level for gravitating into the saturators. The charge for one saturator consists of two carboys, or about 3 cwt. of acid. The neutralized charges are drawn off from the saturators into a settling tank, and from thence, after the impurities have been allowed to settle, are run into the evaporating pan. This is a flat wood tank 6 ft. by 7 ft. in area, lined with lead and containing a coil pipe (1 inch in diameter) through which steam is passed to boil up the liquor. The coil is arranged round the sides of the pan, and the salt falls into a clear space in the centre. It is afterwards shovelled out on to an inclined draining table, and when dried thrown through a trap-door in the wall into the adjoining store.

As the prevention of nuisance from foul smells is an important thing where the works are situated in the neighborhood of dwelling-houses special means were taken to prevent the escape of any sulphurous fumes or ammoniacal vapor. The outlet-pipe conducting the waste gases from the saturators is carried round the building to a condenser situated outside, where any traces of ammonia are condensed along with the aqueous vapor, and the sulphuretted hydrogen is conveyed away by an underground pipe to the retort house, where it is burned in the main flue of the retort-settings, and passes out at the chimney as sulphurous acid.

It was found during the first year of working that the whole of the ammonia escaping from the saturator at the end of the charge was not recovered in the condenser. To remedy this a catch-box was inserted in the fume-pipe. This small box, 2 feet long by 1 ft. 3 inches wide, is filled with dilute sulphuric acid, and the pipe from the saturator dips into the acid, and is perforated in the same manner as the saturator inlet-pipe, so that the waste gases must bubble through the acid before escaping. This effectually prevents any ammonia from being lost. The box is emptied into the settler when acid is neutralized, and fresh acid introduced by a funnel at the top. In starting the apparatus, the still is first heated by passing steam through it, after which the charge is run into the saturator, and the liquor turned on. The waste liquor issues by a cock at the bottom, and is run into a tank at the back of the factory. The steam and liquor supply must be regulated so as to get at the maximum quantity of liquor without allowing any ammonia to escape at the bottom of the still.

When the apparatus was first designed, no provision was made for taking out the fixed ammonia from the waste liquor. During the past summer an arrangement was made for this purpose, as follows:

A plain cylindrical boiler was fixed at the back of the factory, and the waste liquor is pumped into it alternately with milk of lime. Instead of passing the steam from the steam boiler direct into the still, as formerly, it is first sent through a coil in the lime boiler to agitate the liquor, and from thence passes into the still, carrying with it the ammonia driven off from the waste liquor. This arrangement works satisfactorily, except that traces of ammonia are washed back by the liquor descending through the still, which causes part of the work to be done over again. To obviate this, I intend to have the steam and ammonia from the lime boiler introduced higher up in the still, and use an accessory steam supply at the bottom of the still to liberate any remaining ammonia which may be washed down.

With regard to the productive capacity of the apparatus, it is found that with liquor of 9-ounce strength the apparatus can easily make three tons of salt per week. Only one man is employed, who receives occasional assistance from a laborer. Without working overtime, the man in charge can work off five carboys a day on an average, the liquor being delivered through the still at a rate of about 150 gallons per hour. A charge occupies four hours in working off, so that 2½ charges fall within one day's work. The evaporation of charges previously saturated goes on simultaneously with the distillation of the ammonia in the still. The factory is not worked in the night, though this could, of course, be done if required. At present ten hours work per diem is more than sufficient for working up the whole of the liquor made, together with what can be purchased from small gas works in the neighborhood. After stopping work at the close of the day the boiler fire is banked up, and the steam-cock to the still left slightly open to keep the still warm. In the morning a very short time suffices to get up steam again and recommence work.

In concluding, I may express the hope that you will overlook the numerous defects in this paper. The subject is one upon which there is unusual difficulty in obtaining information as to what is done elsewhere, and I regret to say that, although I have asked for results from several gas-works, where apparatus differing from my own are in use, I have not been able to obtain anything which would justify me in drawing comparisons between the economical efficiency of the various apparatus employed.

Discussion.

Mr. Morland—What is the cost of the apparatus?

Mr. Stevenson said the whole expenditure on building and plant was about £1300; the building cost, he thought, rather more than half. If £600 were put down for the plant, exclusive of the building, it would be sufficient.

Mr. Hunt—I should like to know what becomes of the liquor after the ammonia is taken out of it.

Mr. Stevenson—It is allowed to go into the drains; but no nuisance arises.

Mr. Hunt—What system of drainage is there at Peterborough?

Mr. Stevenson said new main drainage had just been completed, and there was a sewage farm. The liquor did not go into the main drainage. There was surface drainage, and the liquor went into that.

Mr. North—Into the river?

Mr. Stevenson—Yes.

Mr. Morland—Have you ever ascertained what amount of fixed ammonia passes off with the liquor?

Mr. Stevenson said before they used the lime boiler there was fixed ammonia to the extent of 1¼ ozs. There was no free ammonia.

Mr. Hunt—Is not the acid you use somewhat expensive—brimstone acid?

Mr. Stevenson—No; I do not find it expensive.

Mr. Winstanley—What is the strength of the liquor?

Mr. Stevenson—Nine oz., and the specific gravity of the acid is 1725; but I have not tested it when diluted.

Mr. Morland said he had lately erected an apparatus on the tower principle for the manufacture of sulphate of ammonia. It had been worked for some time, and they also treated it with lime, but the expense of the apparatus was not nearly so much as had been stated, perhaps not half, and he obtained very good results; in fact, he could, if they were working day and night, have two tons of sulphate made in 24 hours.

Mr. Hunt—What is your make compared with Mr. Stevenson's? How many tons of coal do you carbonize?

Mr. Morland—About 11,000 tons in the year.

Mr. Stevenson—I use about half that quantity.

Mr. Morland said he intended to fill the tower with round pebbles, but could not get them—they were scarce in Gloucester—so he put broken bricks in. He thought pebbles would have been much better.

Mr. Hunt—Do you use lime?

Mr. Morland—Yes.

Mr. Hunt—Do you lose any ammonia at the outlet—does any pass away with the liquor?

Mr. Morland—Very little. The gases from the lime vessel pass up into the tower; the steam is first introduced as it is here.

Mr. Stevenson—At the bottom of the tower?

Mr. Morland—Yes. One of the difficulties I had was getting rid of the waste liquor, and I arranged to run it back into the retort-house, and use it on the hot coke.

Mr. Stevenson—I found that the plan caused a great nuisance one winter, when we were short of water for slaking the coke.

Mr. Morland—It would if you were in the immediate neighborhood of houses.

Mr. Hunt—How about the coke?

Mr. Morland—There is a slight smell. We do not use the waste liquor pure upon it; we use some clean water

Mr. Hunt—Do you use it all that way?

Mr. Morland—Yes.

Mr. Stevenson—What do you find the cost of labor per ton of coal?

Mr. Morland—I should think five or six shillings for labor in manufacture alone.

Mr. Stevenson—Per ton of salt, not more?

Mr. Morland—I could not say precisely, because we have not been working long, and not continuously. Perhaps it would be more. I calculate we should make about £13 clear profit per ton. What return do you get per ton of coal?

Mr. Stevenson—24 lbs. to the ton.

Mr. Woodall—I know that many years ago, at Cheltenham, it was 34 lbs. I believe Mr. Paterson is now getting 34 lbs.

The President—That depends on the coal used.

Mr. Stevenson—If all the ammonia is taken out of the gas, you can do nothing more.

Mr. Darwin—We are selling our ammoniacal liquor at about 2s. 6d. per ton of coal.

Mr. Morland—What does your acid cost you?

Mr. Stevenson—It costs £4 3s. 6d. without carriage. Carriage is 19s.

Mr. Woodall—It might be worth while for Mr. Stevenson to know that it sells at £2 15s. at Leeds.

Mr. Morland—It is a question of carriage.

Mr. Stevenson—I inquired at Sheffield, and found it would not suit; the strength was so low.

Mr. Woodall—The Sheffield company buy from Leeds.

Mr. Peaty said he did not see there was all the danger about the old method which seemed to be imagined. Supposing a curtain was used, there need not be any escape of gas. In his case they never let it blow. They keep a sufficient quantity of liquor in the vat itself, and it was perfectly safe. The charge could be drawn with safety to the workmen, and there were no offensive fumes. He thought there was no great objection to the ordinary saturators with curtains.

Mr. Stevenson said he should like to know what was the fuel account in the other process. He used about 8 cwt. of coke per day with the boiler; it was so small comparatively that they could not use breeze.

Mr. Morland—In my case the liquor is heated before it gets to the top of the tower. I pass the waste gases and steam through the heater.

Mr. Hunt—What price does it realize, after allowing for labor and wear and tear, per ton of coal carbonized?

Mr. Stevenson—The gross profit last year was £627 10s.

The President—Divide that by the tons of coal. What was the quantity of coal?

Mr. Stevenson—5000 tons.

Mr. Hunt—What quantity of liquor per ton of coal do you get?

Mr. Stevenron—It was 22 gallons; now it is much more with the new scrubber, and the strength is 8 to 9 ozs.

Mr. Woodall—The profit you made—2s. 6d. per ton—was prior to taking out the whole of the ammonia from the gas?

Mr. Stevenson—No; at the present time. Prior to that, only a very small sum was realized from the liquor.

Mr. Woodall said that at Leeds they obtained 3s. 2d. where they manufactured their sulphate; but supposing they sold the quantity of liquor produced at these works under the most favorable contract they had in connection with other works, they would receive even more per ton of coal by selling the liquor. The process which they used let loose all the fixed ammonia. They did not realize this, but he was putting up a new apparatus, and looked to obtain 3s. 6d. per ton of coal, where they were having 3s. 2d. now.

Mr. Hunt—What quantity of liquor do you get per ton of coal?

Mr. Woodall—34 gallons of 11-oz. strength.

Mr. Stevenson—What coals do you chiefly use?

Mr. Woodall—Anything that comes in cheapest.

Mr. Hunt—Is that the gross rteurn from the sale of sulphate?

Mr. Woodall—Yes.

Mr. Collett—Not the net gain you would have by making your own sulphate as compared with selling the liquor.

Mr. Woodall—The 3s. 2d. we realize is not debited with anything in the way of interest on plant, but the plant altogether would be dearly bought at £300, so it would not amount to much.

Mr. Stevenson said that at Boston, where about 4500 tons of coal were carbonized per year, they had an elementary apparatus which cost £130, and he found the profit in the year came to about £300; but he did not think they took out all the ammonia. He found he was able to outsell them beyond their own place with the salt; for he had sent salt beyond Boston at a better price than they could get.

Mr. Woodall said he was putting up works for the manufacture of liquor resulting from, say, 40,000 tons of coal per annum. His estimate was that it was to cost £700, including the conversion of an old gasholder into a house.

Mr. Hunt—What is your experience in dealing with sulphuretted hydrogen and waste liquor?

Mr. Woodall—We let the sulphuretted hydrogen go into the boiler flue, and the waste liquor into the drains.

Mr. Stevenson—I know a manufacturer who says labor costs him 30s. per ton of salt. Our expense is 24s. 6d. At the Crystal Palace District gas works it costs about 22s. 6d. per ton for labor.

Mr. Morland—Is that labor in manufacture and packing?

Mr. Stevenson—It includes in my case all the odds and ends.

Mr. Woodall—Ours does not exceed 8s. per ton.

Mr. Hunt—That is a great difference.

Mr. North said that so far as the Midland managers were concerned, he thought they had better sell their liquor. There was a certain amount of danger in the manufacture, and there was the labor and the capital to be employed, and he obtained better returns by selling the liquor. In the half year ending the 30th of June, his liquor realized 3s. 6·18d. per ton of coal carbonized, and 4.07d. per thousand cubic feet of gas made. The average strength was over 5½° Twaddel. He thought when such results could be obtained, it was better to sell the liquor.

Mr. Morland—It depends on the position of the works. In our case it costs 6s. per ton to bring liquor into the neighborhood of Birmingham.

Mr. North—I do not say it applies to Gloucester, but in this district it seems the better course.

Mr. Layton—I anticipate making 2s. per ton of coal carbonized.

Mr. Reeves—I think we shall get 2s. 6d.; last year it was 2s. 3½d. We were calculating the cost of an apparatus, but if we can get the advanced price Mr. North does, it seems better to sell the liquor.

Mr. North—Mine is a price that has been in force for two years.

Mr. Stevenson—If you can get such results, you will not find any gain in manufacturing sulphate. Formerly, when I sent the liquor away, we received £120 a year for it.

A Member said he obtained 16s. 3d. per ton for liquor of 5° Twaddel.

Mr. North—I get 18s. 9d.

The discussion then closed.

The Protection of Lead against Corrosion.

Professor Emerson Reynolds recommends the following method:

Take 16 grammes of solid caustic soda, dissolve it in 1·75 litres of water and add to the liquid 17 grammes of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimetres of water; raise the temperature of the mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass-wool, or other suitable material, into a convenient vessel.

The filtered liquid is then well mixed with 100 cubic centimetres of hot water, containing in solution four grammes of sulpho urea or thio-carbamide. If the temperature of the mixture be maintained at about 70°C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose.

When the operation is properly conducted a layer of galena is obtained which is so strongly adherent that it can be easily polished by means of the usual leather polisher. It is not necessary to deposit the galena from hot liquids, but the deposition is more rapid than from cold solutions.—*Ironmonger.*

Petroleum—The Present Situation and the Outlook.

Herewith we present our readers a brief but comprehensive table of the statistics of the producing region for the year 1880. The year 1880, as it will be seen, greatly distanced all its predecessors in the volume of production and in the consequent accumulation of stock. For the first time in the history of the business, we have accumulated a stock which is in excess of a year's supply, and the production still remains in excess of the current demand. Any considerable appreciation of values in the near future would seem improbable, were it not for the strong counterbalancing facts—viz., that the territory is clearly defined; that the gas is failing; that salt water (which is a sure sign of the end) is making its appearance on the outskirts of the field; and that the production is, without doubt, declining. Add to this the plentitude of money in the country, and we have a combination of facts which warrant better prices, and which will surely bring better prices, as these facts come to be more clearly realized.

It will be seen, by reference to our table showing the production for the year, that we have made some changes in our figures. Hitherto the date

from which we acquired our estimates of stocks at the wells have been exceedingly uncertain and unsatisfactory; but within the past month (through a careful investigation of actual stocks at the wells) we have found a much larger quantity, stored in this way, in the field, than we have heretofore estimated. We have carefully gone over the statement of production, for each month of the year, and reformed the figures in accordance with the changed figures of stocks at the wells. By so doing, we show the largest monthly production of the year in the month of September. From this month forward there has been a monthly decline, in October, of about 1,200 barrels, in November of about 1,100 barrels, and in December about 3,600 barrels, with indications of a still greater decline in January.

This falling off of production is very likely to enlarge the confidence of the holders of this stock, especially if money continues as easy as it has been for some time past. Although we may look, in the present year, for a gradual and continued reaction from the exceedingly low prices which have prevailed during the two years just passed.

The official report of petroleum exports from the United States for eleven months, ending Nov. 30th, 1880, shows a total of 318,315,157 gals., against 379,651,862 gallons for the same time in 1877, a decrease of 61,336,705 gallons in 1880.

GENERAL STATEMENT FOR THE YEAR 1880.

Total production	26,032,421 bbls.
Daily average	71,124 "
Total stock in the producing regions	18,928,430 "
In the custody of the pipe lines	16,594,135 "
In private iron tanks	566,000 "
At the wells	1,768,295 "
Producing wells, average number for the year	13,260 "
Average daily production per well	5 3-10 "
Number of new wells completed during the year	4,217 "
Average daily production of the new wells	22 6-10 "
Number of dry holes	168 "

Shipments of crude and refined reduced to crude equivalent during the year:

To New York	7,072,234 bbls.
To Pittsburgh	960,336 "
To Cleveland	2,535,214 "
To Philadelphia	1,743,536 "
To Boston	478,363 "
To Baltimore	611,505 "
To Ohio River refiners	205,997 "
To California	7,636 "
To other local points	1,477,181 "
Destroyed by fire	582,490 "
Total shipments	15,674,492 bbls.

—*Stowell's Petroleum Reporter*, Jan. 19.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Gas Matters in New Orleans, La.

The wave of water gas opposition has reached the Crescent City, and the municipal authorities are wrestling with the conflicting interests enlisted in the struggle. Some time last summer an ordinance was passed granting the right of laying mains to the Municipal Gas Light Company, on condition that the price of 25 candle gas should not exceed $2.00, less 10 per ct., say $1 80 nett. After long consideration, it seems that these figures were not satisfactory to the water gas people, and they now demand that the price be raised to $2.50, less 10 per cent., or $2.25 nett., for 20 candle gas. In the meantime, the old coal gas company have officially announced that after March 31st their charge will be $2.00, nett., to all consumers. As the establishment of the opposition must depend upon the success of litigation instituted by the old company in assertion of their exclusive privilege, and as the latter have expressed the intention to sell gas as cheaply as possible, the desire of the Council to see the new works actually built will probably not be speedily realized. The ignorance of the average councilman on gas matters is simply wonderful. The catchword competition so dazzles his mental vision that he invariably takes the shadow for the substance, and by legislating in favor of excessive capital in the manufacture of gas he inevitably fastens high prices on his constituents. This has already been the case in New Orleans; but the lesson has been forgotten within five years. Fortunately for the gas consumers, however, the keen competition of coal oil compels the company to keep prices down, in order to maintain its consumption, and has thus far saved them from the legitimate consequences of bad legislation.

Under present circumstances, with gas selling here at $2.00 for illuminating purposes, and $1.50 for heating and motive power, it is difficult to believe that the water gas ordinance will ever be more than waste paper. No sensible capitalist will invest his funds in the forlorn hope of profit to be obtained out of a lawsuit, followed by a determined resistance at every point.

In other cities the old coal gas companies have allowed the opposition to build works and lay mains and commit themselves to a desperate struggle before making any concession to the public. Here, on the contrary, the fullest concession is made before one dollar has been invested in plant, and the public has no grievance to be worked upon.

I shall keep you posted as to future developments.

COAL GAS.

NEW ORLEANS, LA., Jan. 20th, 1881.

The Capture of a City.

Mr. Editor:—

A city is seldom nowadays so completely captured as the whaling city of New Bedford seems to be surrendered to the Automatic Gas Lamp and Lighting Company of New York, which has, in an evil moment, spied out its defenceless condition.

It is the old, old story over again; with banners of economy, monopoly, etc., an entrance was effected which substituted gasoline lamps for gas on every street post, shutting off even the ornamental lanterns of the public buildings. Parading vigorously their forces, in due course of time their victory was complete, gas was nowhere to be seen, and, barring the usual break downs and go outs, gasoline gained credit. With smart application of elbow grease, and by hard swearing, the contract was kept, and a tolerable light has been seen in the new fifteen dollar lanterns. To keep the citizens in subjection a new sensational system of bareback riding, with lofty feats of horsemanship, was devised for lighting and extinguishing, and tanks, like quaker guns, paraded the city daily.

Immense "millions" are in the new departure seemingly, though it is significant that the company do not choose to take the contract for the new year.

And, therefore, as the lawyers say, to continue the history, and because it was more profitable to do so, the new concern would now assume the control, and nominate the Mayor; and just here the tragedy thickens, for it is apparent that a Mayor favorable to the project would buy the lamps and relieve the company of its valued steeds and police patrol.

The chairman who so quickly recognized the beauty and efficiency of the new light was first chosen, and all were sworn to the new leader; but he found employment in another way, and so, another was chosen; but, alas! the company must leave the unsuspecting aborigines to have their own quarrels, and choose their own Mayor, only reserving to itself the presentation to the city council of a long petition praying for more light which, being duly read, was referred to the chairman of the Street Lighting Company who had toiled in obtaining the signatures for it, and we need not add with how much commendable alacrity this official reported himself a success.

But now it will conquer. Gathering its forces in secret council, three of the members of the City Committee, like Macbeth's strange visitors, stirred and sipped the seething cauldron. One put the question, another seconded it, the third put it to vote, and, with unanimous voice, a secret resolution was voted to buy all the truck and trucking horses, lamps, syringes, beds, towels and all necessary appurtenances, to the value of $25,000, and to leave its name forever the Automatic Street Lighting Department of the city of New Bedford.

But quarrels arose, and bad words and bad names were said, in fun, and the secret was told and the position became perilous. Cast out from its choice the company must yet win, and like the world-renowned appendage to the sage of Chappaqua, the tail must find its dog, and lo, presto! Mr. Yeaton is victorious, and follows the torchlight procession, on the night after election—full forty feet behind—with wagons, quaker guns, and all strangely suggestive of the appendage of the boy's bobbing kite.

And now the conquest is over. The contracts presented by the company for 1000 lights, and all their trimmings at retail prices, are drawn and signed, and unless the lawyers interfere, the city is doomed.

Fears of a like fate might possibly deter other cities from opening their gates to General Yeaton and his cry for economy.

Why? Listen. The expenses of the department are as yet only ten months old. In that time the city has spent 50 per cent. more than in the year previous over this precious invention, and a little matter of $25,000 and more, besides royalties and other minor expenses loom up like rocks ahead.

Economical? Very! Beware!

GAS.

By the way, isn't the new Brush light simply the old rush light with B-onnet?—Norristown *Herald*.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,

PROPRIETORS.

Editor—G. WARREN DRESSER.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH

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WEDNESDAY, FEB. 2, 1881.

Official Report of Examinations of Gas for three Weeks ending Jan. 29, 1881, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

1881. Jan.	Time of Day at which Test were made.	New York Gas Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
		†	*	†	‡	*	†
10	Between	23.30	19.96	22.73	23.92	19.13	24.03
11		24.10	19.91	23.34	23.29	18.90	24.99
12	9.30 A.M.	25.68	19.79	23.73	23.56	18.93	26.25
13	and	24.74	19.56	23.39	22.64	18.79	25.26
14	1 P. M.	19.72	19.41	24.57	22.98	18.61	25.65
15		21.91	18.79	23.94	22.93	18.56	24.97
	Average	23.24	19.57	23.62	23.22	18.82	25.19
17		22.13	19.21	25.67	24.17	19.01	24.82
18		21 39	19.28	25.66	23.38	18.94	26.54
19		22.61	19.37	22.88	22.59	17.72	25.65
20		23.59	19.79	23.63	23.18	18.73	25.85
21		23.19	19.65	23.82	23.24	18.53	25.08
22		21.96	19.19	25.21	23.58	17.51	27.38
	Average	22.48	19.41	24 48	23.35	18.40	25.88
24		20.58	20.20	24.96	23.70	19.86	23.55
25		23.84	20.14	25.70	24.12	19 97	25.69
26		23.69	19.55	26.48	24.42	19.56	27.71
27		22.84	19.21	24.92	24.62	19.71	28.21
28		23.10	19.43	24 58	24.97	19.63	26.33
29		27.02	18.60	25.21	24.81	19.30	25.93
	Average	23.51	19.52	25.31	24.44	19.67	26.23

* Five foot lava tip with check.
† Bray's slit union, No. 7.
‡ Bray's slit union, No. 6.

E. G. LOVE, Gas Examiner.

Accidents From Gas.

Michael Lynch, a butcher, 31 years old, of 328 East 27th street, did not turn off the gas after he had blown it out on Wednesday night. He was not found till last evening, and at midnight he was unconscious in Bellevue Hospital.—*N. Y. Sun*, Jan. 14.

On Tuesday night John Brennan, 23 years old, a native of England, blew out the gas in his room at the New England Hotel, 30 Bowery. He was so nearly suffocated when discovered that the surgeon at St. Vincent's Hospital pronounced him in a dying condition. He is a discharged soldier of the Fifth United States Artillery.—*N. Y. Sun*, Jan. 22.

John Galen and H. Knapp, two young men from Newark, N. J., took a room at the Central Hotel, Canal and Elm streets, Saturday night. They blew out the gas, and were discovered yesterday morning nearly suffocated. They were sent to St. Vincent's Hospital.—*N. Y. Sun*, Jan. 24.

Youngstown Gas Company Election.

At the meeting of the stockholders of the Gas Company last evening all the former directors and officers of the company were re-elected, except that Mr. John C. Wick was elected director in the place of Mr. F. O. Arms, deceased. At the meeting of the Board of Directors, held after the adjournment of the stockholders' meeting, it was decided to reduce the price of gas as follows, the reduction to take effect February 1, 1881:

Less than 5,000 feet monthly, $1.90; 5,000 feet to 15,000 feet, $1.70; 15,000 feet and over, $1.60.—Youngstown (Ohio) *News*, Jan. 26.

To Prevent Gas Explosions.

The late Mr. G F. Ansell, the inventor of the well-known fire-damp indicator, according to *Engineering* recently applied the principle of that apparatus to the production of a handy little instrument for the detection of gas leaks. It will be remembered that the action of Mr. Ansell's fire-damp indicator was founded on the fact that different gases have different rates of diffusion through a porous body, the velocities of diffusion being as the square roots of the respective densities of the gases. In the gas leak indicator this property is taken advantage of as follows: A small chamber is provided, having its back formed by a disc of terra cotta, this chamber being provided with a small stop-cock, by which its interior can be placed in communication with the outer air. If, when this stopcock is closed, the indicator be taken into a room where a gas leakage exists, the gas, in virtue of the above-named law of diffusion, enters the chamber through the terra cotta disc more rapidly than the inclosed air escapes, and the pressure in the chamber consequently rises This increase of pressure is utilized to move a hand on a dial at the front of the instrument, each pressure corresponding to a certain percentage of gas in the atmosphere in which the indicator is placed.

More Light at Vincennes, Ind.

At a meeting of the City Council last night Councilman Hellert, from the Committee on Gas, reported that the committee who were appointed to confer with the gas company for the erection of fifty additional lamp posts throughout different parts of the city, had been successful in obtaining a proposition from Geo. G. Ramsdell, Superintendent of the Citizens' Gas Light Company. It provides that posts shall be erected on the following thoroughfares and the streets which they intersect: Barnet, Seminary, Second, Eighth, Ninth, and Tenth. On Mr. Hellert's motion the contract was accepted and the work ordered performed under the supervision of the Committee on Gas.—Vincennes *Daily Sun*, Jan. 25.

Four more children have gone above to be angels. They had been left alone with a kerosene lamp.—*N. Y. Herald.*

Prices of Gas Coal.

The following are the prices at which the companies mentioned are shipping coal:

	New York.	Baltimore.	S. Amboy
Penn	$5.25	$4.10	$4.80
Scott's Youghiogheny	5.00	3.75	
Montauk	5.00	3.70	
Newburgh Orrel	5.00	3.75	
Tyrconnell	5.00	3.75	
Despard	5.00	3.75	
West Fairmount	5.00	3.75	

To give some idea of the relative prices at the East and the West we give the following quotations of coal furnished by the Fort Pitt Coal Company:

At Pittsburgh, f.o.b. cars	$1.80	per ton of 2000 lbs.	
At Cleveland, f.o.b. cars	3.40	"	"
At Buffalo, f.o.b. cars	3.70	"	"
At Chicago, f.o.b. cars	4.50	"	"
At Indianapolis, f.o.b. cars.	3.75	"	"

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks,

(with W B Scott & Co.,)

34 PINE STREET, NEW YORK CITY.

FEBRUARY 2, 1881.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

Gas Co.'s of N. Y. City.	*Capital.*	*Par.*	*Bid.*	*Asked*
Central	466,000	50	58	62
Harlem	1,800,000	50	62½	65
" Bonds	170,000			103
Manhattan	4,000,000	50	175	180
Metropolitan	2,500,000	100	135	140x
" Scrip	$1,000,000	..	102	103x
Mutual	5,000,000	100	60	65
" Bonds, go'd	900,000	1000	100	104
Municipal	1,500,000	100	150	160
" Bonds	750,000		106	110
New York	4,000,000	100	92½	95
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	105	110
Citizens	1,200,000	20	40	45
" S. F. Bonds.	320,000	1000	100	105
Fulton Municipal	1,500,000	100	54	58
Peoples	1,000,000	10	20	25
" Bonds	290,000	...	90	95
" Scrip	250,000	...	75	85
Metropolitan	1,000,000	100	50	55
Nassau	1,000,000	25	40	45
" Ctfs.	700,000	1000	95	100
Williamsburgh	1,000,000	50	60	64
" Bonds			98	103
Kings Co	135,000	100	55	60
" Bonds	40,000	—	—	—
Richmond Co., S. I.	300,000	...	70	75
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	72	76
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	85	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			84	85
Bonds			109	110
East Boston, Mass		25	114	120

Hannibal, Mo.....	100,000	100	95	100
Hartford, Conn.....	700,000	25	140	144
Hempstead, L. I....	25,000	100	...	—
Halifax N. S.....	400,000	40	148	150
Hamilton, Ontario...	150.000	40	117½	
Jersey City	750,000	20	140	150
Jacksonville, Ill.....	120,000	50	100	...
Lewistown Maine...	400,000	100	—	100
Laclede St Louis Mo.	1,200,000	100	108	110
Montreal, Canada....	2,000,000	100	148	149
New Haven, Conn...		25	128	130
Oakland, Cal.....			34	35
Peoples, Jersey City		...	85	90
" " Bds.				5
Pittsfield, Mass.....			120	130
Rochester, N. Y.....		50	70	80
" Citizens		100	30	35
Rondout & Kingston			75	80
St. Louis Missouri..	600,000	50	250	254
San Francisco Gas Co., S. Fr'isco Cal.			74	75
Toledo, Ohio..... . .			95	97
Troy, Citizens.	600,000	100	—	—
Washington, D. C...	1,500,000	20	215	225
" Scrip	500,000	20	150	160
Woonsocket, R. I....	150,000	100	80	...
Wilmington, Del....		50	174	...
Yonkers.....		50	—	70

Metropolitan, of New York city, declared a dividend of 6% on stock, and 3½ on scrip, payable February 10th. 300 shares of Manhattan sold at auction @ 170–170¾. 109 shares Harlem, New York, @ 63¼.

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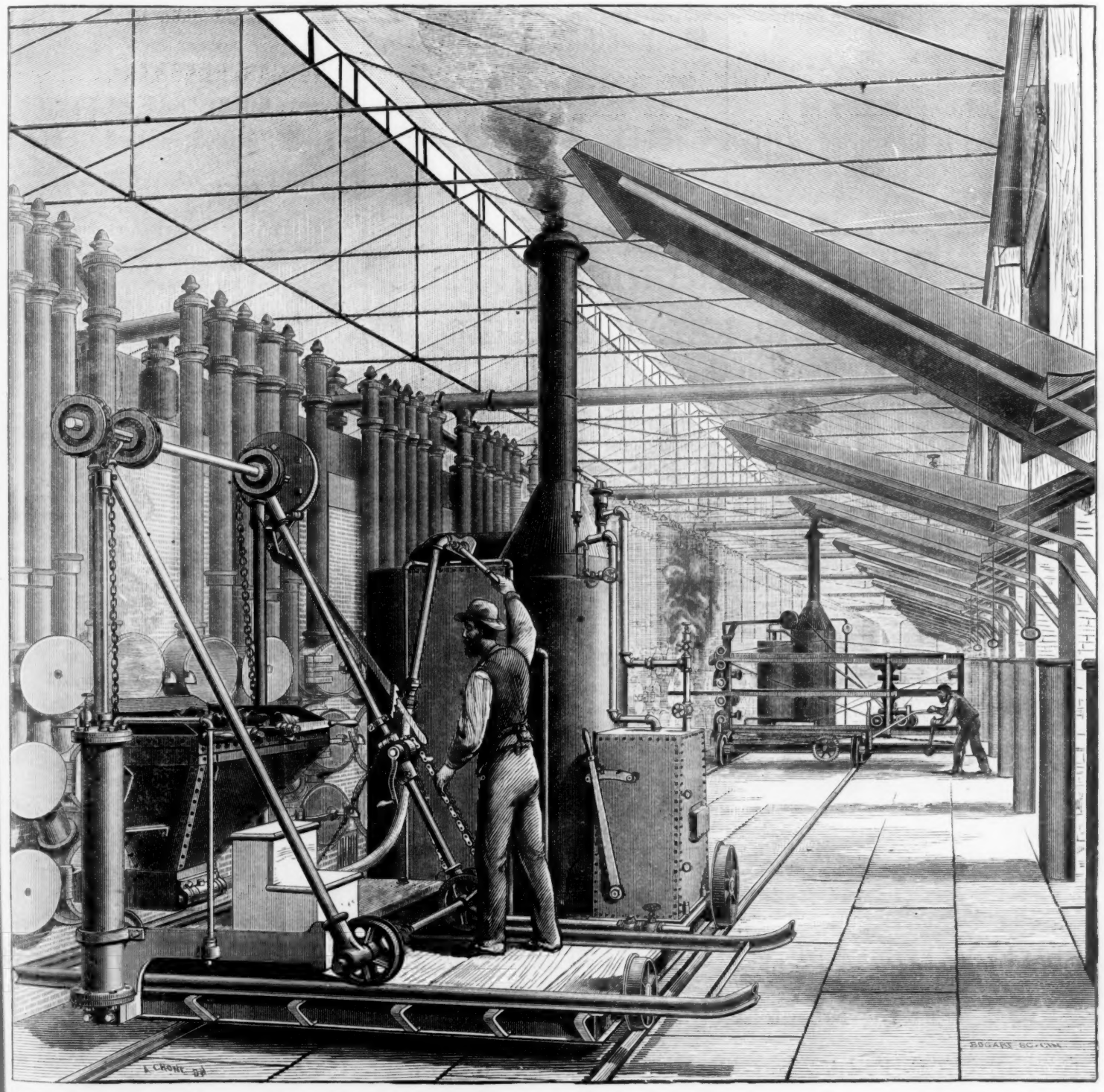

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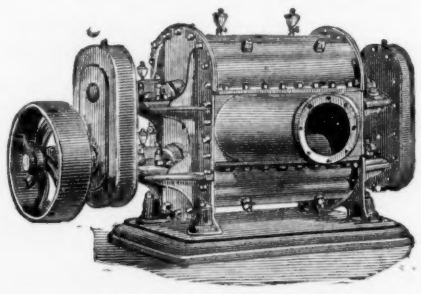

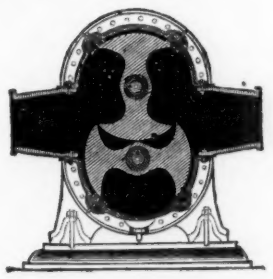

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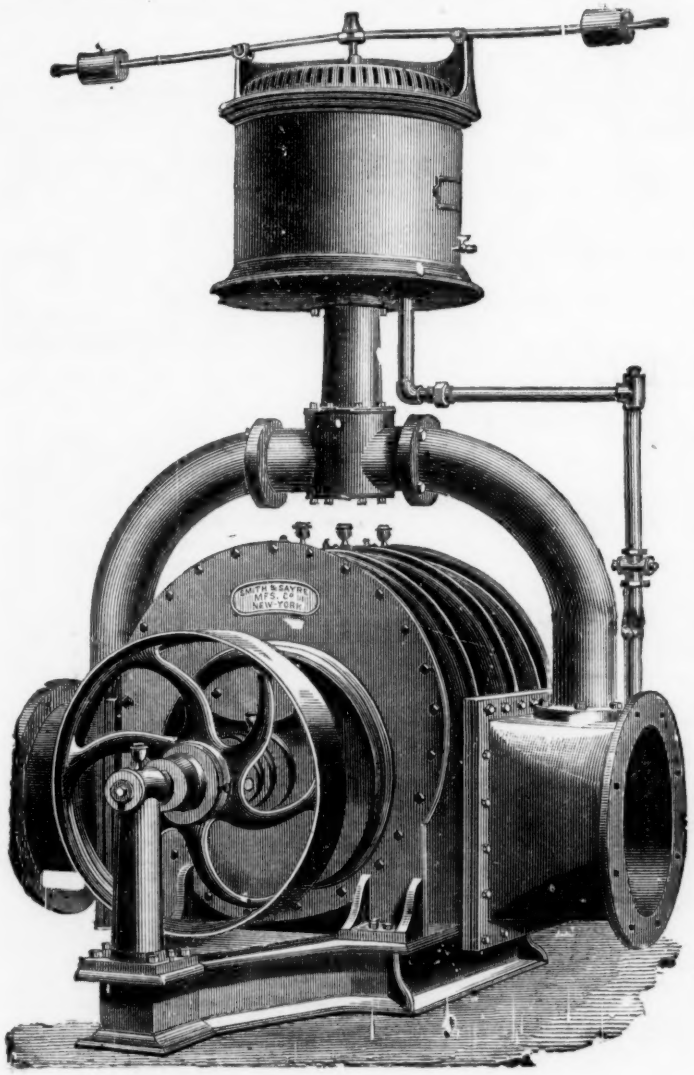

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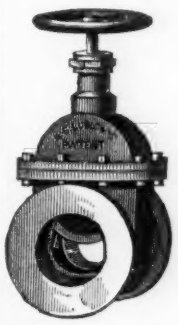

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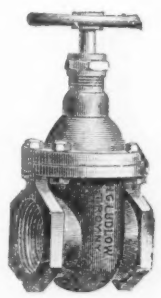

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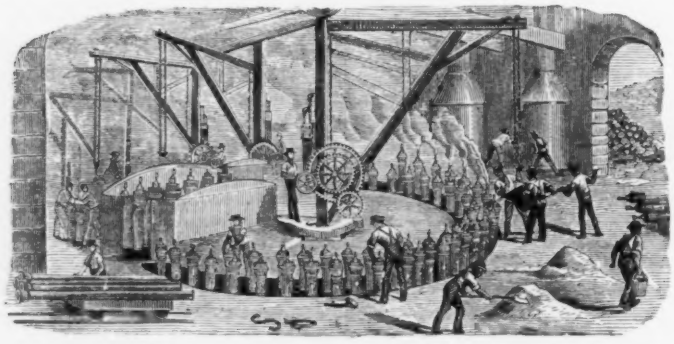

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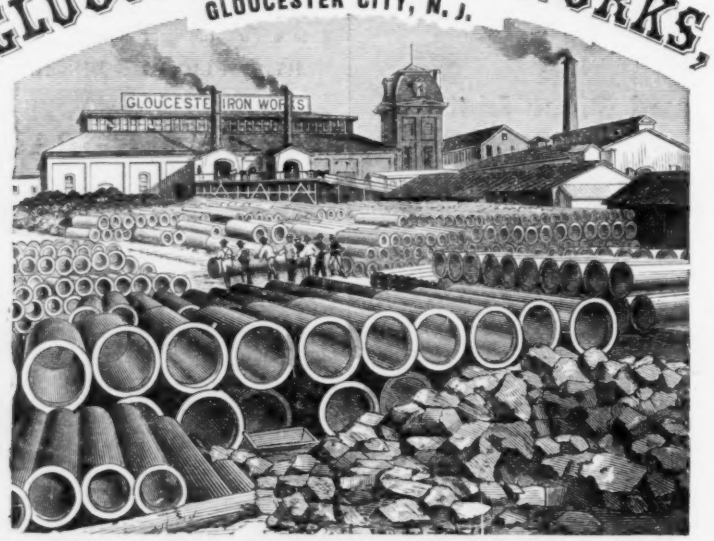

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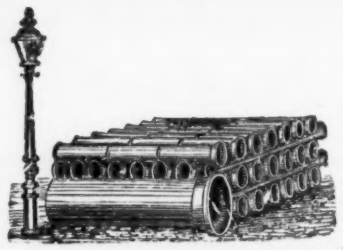

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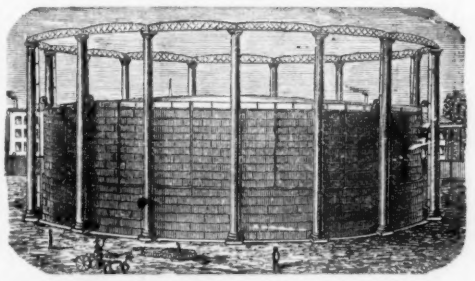

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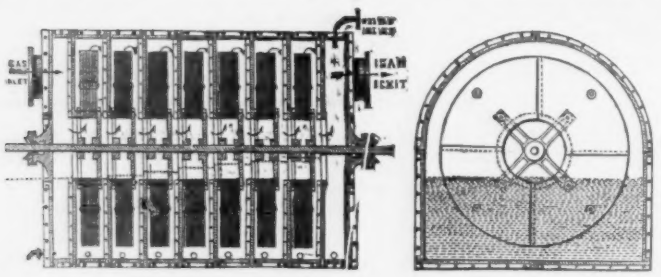

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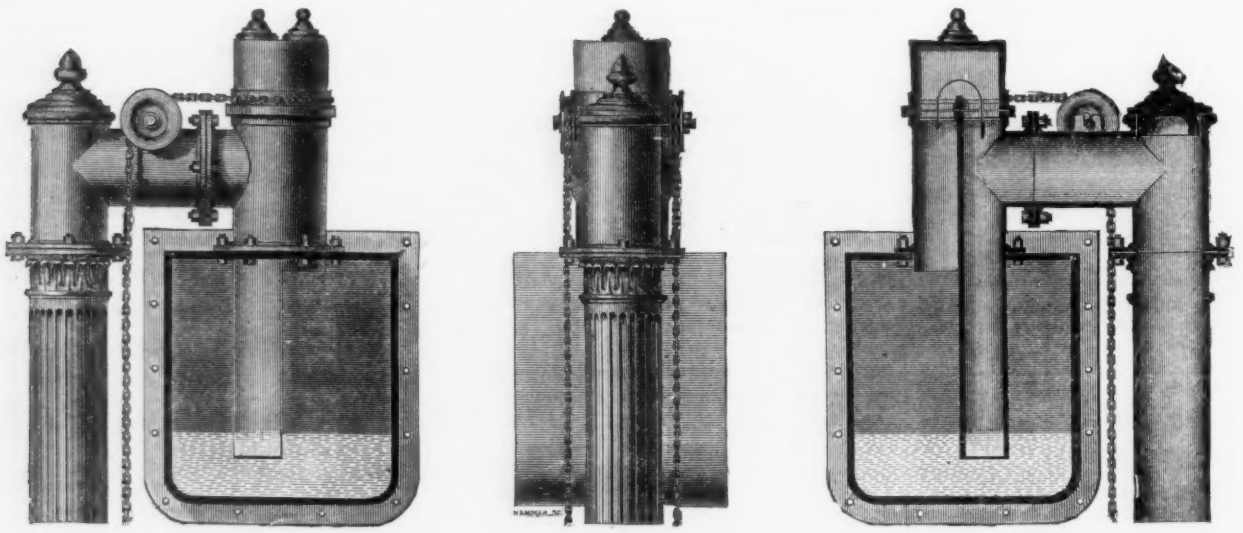

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